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MEMO

Date: **April 18, 2022**

To: **Matthew Moore, Associate Project Manager, David J Powers & Associates**

From: **Michael Keinath, PE**
Ivy Tao, PhD
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Subject: **CEQA AIR QUALITY AND HEALTH RISK ASSESSMENT FOR THE 435 E. 3RD AVENUE MIXED-USE PROJECT, SAN MATEO, CALIFORNIA**

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Ramboll US Consulting, Inc. (Ramboll) conducted California Environmental Quality Act (CEQA) air quality and health risk analyses for the proposed 435 E. 3rd Avenue Mixed-Use Project in San Mateo, California (the "Project").

According to the Project sponsor, the Project would include the demolition of all existing on-site structures and the construction of approximately 33,900 square feet of office uses and 5 residential units, with one of which being devoted in the low-income category. No on-site parking is proposed. Nearby uses to the site include residential uses and commercial uses surrounding the building in all directions; California State Highway 82 along with Caltrain and heavy rail tracks to the west; and U.S. Route 101 to the east.

The proposed land uses at the Project site are listed in **Table 1**.

CEQA THRESHOLDS OF SIGNIFICANCE

The City of San Mateo is the lead agency responsible for Project approval. Per City of San Mateo requirements, Ramboll evaluated the Project in accordance with the current Bay Area Air Quality Management District (BAAQMD) CEQA Guidelines, which were updated in May 2017.[1] These guidelines present methods for evaluating compliance with CEQA as well as thresholds for determining significance. With respect to the Project, the current BAAQMD thresholds of significance are as follows:

[1] BAAQMD. 2017. California Environmental Quality Act (CEQA) Air Quality Guidelines. May. Available online at: http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf.pdf?la=en

BAAQMD CEQA Thresholds of Significance	
Criteria Air Pollutants (and Precursors)	**Construction-Related Average Daily Emissions (lbs/day)**
ROG	54
NO_X	54
PM_{10}	82 (exhaust only)
$PM_{2.5}$	54 (exhaust only)
PM_{10}/$PM_{2.5}$ (fugitive dust)	Best Management Practices
CO (local concentration)	None
Risks and Hazards for New Sources and Receptors (Individual Project)	Compliance with Qualified Community Risk Reduction Plan OR Increased cancer risk of >10.0 in a million Increased non-cancer risk of > 1.0 HI (chronic or acute) Ambient $PM_{2.5}$ increase: > 0.3 µg/m^3 annual average Zone of Influence: 1,000-foot radius from fence line of source or receptor
Risks and Hazards for New Sources and Receptors (Cumulative Threshold)	Compliance with Qualified Community Risk Reduction Plan OR Increased cancer risk of >100 in a million (from all local sources) Increased non-cancer risk of >10 HI (from all local sources) (chronic) Ambient $PM_{2.5}$ increase: > 0.8 µg/m^3 annual average (from all local sources) Zone of Influence: 1,000-foot radius from fence line of source or receptor
Odors	None

Abbreviations:
CO = Carbon Monoxide
Lbs = pounds
MT of CO_2e/yr = metric tons of carbon dioxide equivalent per year
MT CO_2e/SP/yr = metric tons carbon dioxide equivalent per service population per year
NOx = oxides of nitrogen
$PM_{2.5}$ = Particulate Matter less than 2.5 microns
PM_{10} = Particulate Matter less than 2.5 microns
ROG = Reactive Organic Gas
µg/m^3 = micrograms per cubic meter.

Since the City of San Mateo has separately arranged for a greenhouse gas (GHG) analysis, this Technical Memorandum only evaluates construction Criteria Air Pollutants (CAP) emissions and health effects of Toxic Air Contaminants (TACs) emitted during Project construction and operation, including a cumulative assessment on the impacts of all sources of TACs within the zone of influence on the existing and proposed sensitive receptors.

The BAAQMD operational emissions screening size for mid-rise apartments is 494 dwelling units and for general office building is 346,000 square feet. Because the Project is significantly below both operational criteria pollutant screening levels, an operational CAP assessment is not included in this memorandum.

SUMMARY OF RESULTS

Construction CAP emissions are presented in **Table 2**. As shown in the table, CAP emissions for construction are below the BAAQMD thresholds of significance. Health risk impacts from the Project and on a cumulative basis are shown in **Tables 3** and **4**, respectively. The estimated health risk impacts are also below the BAAQMD thresholds of significance.

DATA SOURCES AND EMISSIONS METHODOLOGIES

The following sections describe the input data and methodologies used in the construction and operational emissions analysis. Detailed information for each section can be found in the referenced tables and appendices.

Construction CAP Emissions Estimation

Ramboll utilized the California Emission Estimator Model version 2020.4.0 (CalEEMod)[2] to quantify all construction CAP emissions. CalEEMod is a statewide program designed to calculate both CAP and GHG emissions for development projects in California. CalEEMod provides a simple platform to calculate both construction emissions and operational emissions from a land use project. It calculates both the daily maximum and annual average for CAPs as well as total or annual GHG emissions.

CalEEMod utilizes widely accepted models for emission estimates combined with appropriate default data that can be used if site-specific information is not available. CalEEMod uses sources such as the US Environmental Protection Agency (USEPA) AP-42 emission factors,[3] California Air Resources Board's (CARB) on-road and off-road equipment emission models such as the EMission FACtor model (EMFAC) and the Emissions Inventory Program model (OFFROAD), and studies commissioned by California agencies such as the California Energy Commission (CEC) and CalRecycle.

Construction emissions from the Project include both on-site, off-road heavy equipment as well as off-site, on-road vehicle travel. As described below, Ramboll updated several default assumptions to Project-specific information to generate emission estimates with CalEEMod, for consistency with BAAQMD and California Air Pollution Control Officer Association (CAPCOA) methods. Where project-specific data were not available, Ramboll used CalEEMod® defaults for the land uses shown in **Table 1**. The construction phasing, equipment, and trip rate assumptions are shown in **Tables 5**, **6**, and **7**. It was assumed that construction would start as early as 2022. Emissions from architectural coating emissions were also estimated using methodologies consistent with CalEEMod and summarized in Table **8**.

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[2] California Air Pollution Control Officers Association (CAPCOA). 2020. California Emissions Estimator Model. Available at: http://www.CalEEMod.com/.

[3] The USEPA maintains a compilation of Air pollutant Emission Factors and process information for several air pollution source categories. The data is based on source test data, material balance studies, and engineering estimates. Available at: http://epa.gov/ttnchie1/ap42/.

Updates to CalEEMod Default Assumptions

In preparing Project construction emissions, several updates were made to modify the CalEEMod default factors and assumptions. These include the following areas:

- Project construction is assumed to use fleet-average tier diesel engines for all off-road equipment. Construction equipment during a given construction year in the OFFROAD model is a mix of Tier 1, 2, 3, Tier 4 Interim and Tier 4 Final engines based on statewide equipment inventory for that given year. This assumes that the Project would use construction equipment as available and not specify a particular engine Tier level.
- Off-road equipment hours were updated to reflect utilization of each equipment per phase as provided by the Project sponsor.
- Haul truck trips for demolition were calculated by CalEEMod based on the amount of demolition required for construction. The haul truck trips for grading were estimated by the Project sponsor based on soil exported and imported during construction. These estimates are shown in **Table 7**.

LOCAL COMMUNITY RISK AND HAZARD IMPACTS

Local Carbon Monoxide (CO) Impacts

According to the 2017 BAAQMD CEQA Guidelines, the Project would result in less-than-significant localized CO concentrations if it meets the following criteria:

1. Is consistent with county and local congestion management plans, and
2. Does not increase traffic volumes at affected intersections to more than 24,000 vehicles per hour.

Based on the traffic volume data provided by the Project sponsor (see **Appendix A**), the project would generate less than 200 vehicle trips per hour during both the morning and evening rush hours. Thus, operational impacts from Project CO emissions would be less than significant.

Toxic Air Contaminant (TAC) Emissions

The TAC emissions associated with the Project construction were calculated with the following assumptions and exceptions:

1. Diesel Particulate Matter (DPM): DPM emissions were used to evaluate the cancer risk and non-cancer chronic HI from Project construction. In this analysis, both onsite (i.e., construction equipment) and local offsite (i.e., construction mobile sources) particulate matter less than 10 microns (PM_{10}) exhaust emissions[4] were calculated as DPM and modeled within the Project boundary (as discussed in the next section). This analysis also conservatively assumed the small fraction of non-diesel PM_{10} (i.e., PM_{10} emissions from gasoline fueled passenger vehicles) was DPM, which has greater human health impacts.
2. $PM_{2.5}$: Exhaust and fugitive particulate matter less 2.5 microns ($PM_{2.5}$) emissions were used to evaluate the $PM_{2.5}$ concentration due to the Project construction. Fugitive PM emissions were calculated using CalEEMod® methodologies as shown in **Tables 9-11**. The modeled emissions were calculated using the same conservative assumptions as the DPM calculation.

Total modeled emissions are presented in **Table 12** as total PM_{10} and $PM_{2.5}$ from construction.

BAAQMD recommends analyzing TAC emissions from roadways with over 10,000 vehicles per day. As discussed above, per the traffic generation assessment conducted by the transportation consultant.

[4] Local offsite (mobile source) emissions were conservatively calculated by including CalEEMod® on-road emissions for the entire default trip length in the screening model.

(see **Appendix A**), the Project is expected to generate substantially less net vehicle trips than 10,000 vehicles per day, so TAC emissions from operational mobile sources is not needed.

Health Risk Assessment

Ramboll analyzed Project construction-related and operational health risks by estimating ambient air concentrations of DPM and $PM_{2.5}$. To estimate air concentrations of DPM and $PM_{2.5}$, Ramboll used AERMOD, a steady-state Gaussian plume model developed by USEPA for regulatory applications. AERMOD requires emission source locations and release parameters, receptor locations, and processed meteorological data. The construction source parameters are shown in **Table 13**. Ramboll used five years of meteorological data from the San Francisco International Airport, which was the nearest dataset available to the Project.

The AERMOD input files are provided electronically as **Appendix B**. The receptor and source setup are shown in **Figure 1**. It should be noted that the residential receptors on the block south of the Project site were determined to be fourth-floor receptors, while other receptors are at ground-level.

Modeled Emissions

Based on the construction schedule provided by the Project sponsor, the Project will be completed in one phase. All emissions from Project construction were averaged over the period of construction (approximately six months) and modeled on an annual basis for off-site receptors. These modeled emission rates are shown in **Table 12**.

Exposure Parameters and Cancer Risk Calculation

In February 2015, Office of Environmental Health Hazard Assessment (OEHHA) released the updated Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments, which combines information from previously-released and adopted technical support documents to delineate OEHHA's revised risk assessment methodologies based on current science.[5] The BAAQMD has issued HRA Guidelines formally adopting the OEHHA 2015 Guidance Manual.[6] This analysis followed the recommended methodology from the 2015 OEHHA Hot Spots Guidance.

Ramboll conservatively evaluated Project impacts due to construction emissions using default exposure assumptions for a resident child from OEHHA unless otherwise noted.[7] The resident child scenario assumes a much higher daily breathing rate and age-sensitivity factor (ASF)[8] than other sensitive receptor populations and therefore is the most conservative scenario to evaluate for this analysis. Other sensitive receptor locations were identified using a report from Environmental Data Resources (EDR). The EDR report identified daycares, childcares, and elementary schools in Project vicinity. Exposure periods for each of the non-residential sensitive land uses are assumed to be the same as the age range accepted at the location. The exposure parameters used to estimate excess lifetime cancer risks for the nearby sensitive receptors are presented in **Table 14**.

The dose estimated for each exposure pathway is a function of the concentration of a chemical and the intake of that chemical. The intake factor for inhalation, IF_{inh}, can be calculated as follows:

$$IF_{inh} = \frac{DBR * FAH * EF * ED * CF * ASF * FY}{AT}$$

[5] OEHHA. 2015. Air Toxics Hot Spots Program. Risk Assessment Guidelines. Guidance Manual for Preparation of Health Risk Assessments. February.

[6] BAAQMD, 2020. Health Risk Assessment Modeling Protocol. December.

[7] BAAQMD. 2010. BAAQMD Air Toxics NSR Program Health Risk Screening Analysis (HRSA) Guidelines. January.

[8] *Ibid.*

Where:

IF_{inh}	=	Intake Factor for Inhalation (m^3/kg-day)
DBR	=	Daily Breathing Rate (L/kg-day)
FAH	=	Fraction of Time at Home (unitless)
EF	=	Exposure Frequency (days/year)
ED	=	Exposure Duration (years)
AT	=	Averaging Time (days)
CF	=	Conversion Factor, 0.001 (m^3/L)
ASF	=	Age Sensitivity Factor (unitless)
FY	=	Fraction of Year, to correct annualization of partial year emissions

The chemical intake or dose is estimated by multiplying the inhalation intake factor, IF_{inh}, by the chemical concentration in air, C_i. When coupled with the chemical concentration, this calculation is mathematically equivalent to the dose algorithm given in the OEHHA Hot Spots guidance.[9]

The toxicity assessment characterizes the relationship between the magnitude of exposure and the nature and magnitude of adverse health effects that may result from such exposure. This HRA evaluated theoretical exposures to TACs for two categories of potential adverse health effects, cancer and non-cancer endpoints. Toxicity values used to estimate the likelihood of adverse effects occurring in humans at different exposure levels are identified as part of the toxicity assessment component of a risk assessment.

Excess lifetime cancer risk and chronic hazard quotient (HQs) calculations for Project construction and operation utilized the toxicity values for DPM. Toxicity values for DPM are as presented in **Table 15**. [10]

Cancer risk and chronic HI were calculated from ambient annual concentrations using intake factors, cancer potency factors, and chronic reference exposure levels calculated consistent with the 2015 OEHHA Hot Spots Guidance[11] and 2020 BAAQMD guidance.[12]

As shown in **Table 3**, the cancer risk, non-chronic hazard index, and maximum $PM_{2.5}$ concentration from Project construction at the maximally exposed individual resident (MEIR) receptor and the maximally exposed individual student (MEIS) would be below the applicable BAAQMD's thresholds. The health risk impacts of the project construction are therefore less than significant. The locations of the on-site MEIR and MEIS are shown in **Figure 2.**

Cumulative Health Risk Assessment

In accordance with BAAQMD CEQA guidelines, Ramboll conducted a cumulative HRA for both offsite sensitive receptors and new onsite sensitive receptors created by the Project. The cumulative assessment tabulates the impact of Project-related risks plus existing offsite sources (stationary and mobile) at the on-site and off-site MEIRs and the off-site MEIS locations. The evaluation requires the

[9] Cal/EPA. 2003. The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments. Office of Environmental Health Hazard Assessment. August.

[10] Cal/EPA. 2020. OEHHA/ARB Consolidated Table of Approved Risk Assessment Health Values. October. http://www.arb.ca.gov/toxics/healthval/contable.pdf

[11] OEHHA. 2015. Air Toxics Hot Spots Program. Risk Assessment Guidelines. Guidance Manual for Preparation of Health Risk Assessments. February.

[12] BAAQMD, 2020. Health Risk Assessment Modeling Protocol. December.

identification of any stationary and mobile sources within 1,000 feet of the Project boundary. In addition to the evaluation of each single source, the combined health risk from all TAC and $PM_{2.5}$ sources are evaluated.

Sources evaluated in the cumulative health risk assessment include any BAAQMD permitted stationary source, roadways with over 10,000 vehicles per day, and any other major source of emissions within the zone of influence such as railways. The BAAQMD provides tools with conservative estimates of impacts from these sources, including a stationary source tool and raster files for railways major streets, and highways.

BAAQMD's highway raster file includes impacts from highways in the Bay Area while the major street raster file includes impacts from all roadways with daily traffic above 30,000 vehicles per day. BAAQMD previously had a roadway screening analysis calculator that could be used to calculate impacts of roadways between 10,000 and 30,000 vehicles per day, but BAAQMD has since removed this roadway screening analysis calculator from their website. There is currently no alternative BAAQMD tool available for quantifying these results. There are no roadways with daily traffic between 10,000 and 30,000 vehicles per day within 1,000 feet of the MEIRs so the impacts from non-major street, non-highway roadways were not calculated.

The raster files and stationary source screening tools were used to estimate the health impacts from all highways, major streets, railways, and stationary sources and combined with the impacts from all other sources at the construction off-site MEIS and on-site cumulative MEIR.

The combined impact from all the sources results in a cancer risk of 72 in 1 million at the on-site MEIR, 73 in 1 million at the off-site MEIR, and 61 in 1 million at the off-site MEIS, compared to a threshold of 100 in 1 million. The combined non-cancer hazard index at all three sensitive receptors are less than 0.1 (threshold of 10). The combined maximum $PM_{2.5}$ concentrations are 0.32 $\mu g/m^3$ at the on-site MEIR, 0.31 $\mu g/m^3$ at the off-site MEIR, and 0.28 $\mu g/m^3$ at the off-site MEIS, compared to a threshold of 0.8 $\mu g/m^3$. Details of each source included in the cumulative analysis are presented in **Tables 4**. These results are all below the BAAQMD cumulative thresholds of significance; thus, the cumulative health risk impacts associated with the Project are less than significant.

CLOSING

The analysis presented above represents emissions and health risk impacts from construction of the proposed Project. The Project does not exceed any BAAQMD CEQA significance thresholds, and therefore, no mitigation measures are required.

Attachments:

Tables

Figures

Appendix A: Traffic Study

Appendix B: AERMOD Input Files (provided Electronically)

TABLES

Table 1
Land Use Summary for Proposed Project
435 E 3rd Avenue Mixed-Use Project
San Mateo, CA

Project Description Land Use Type[1]	CalEEMod® Land Use Type	CalEEMod® Land Use Subtype	Value	Units	Square Footage	Acreage
Residential Space	Residential	Apartments Mid Rise	5	Dwelling Units	5,663	0.13
Office Space	Commerical	General Office Building	33.876	1000sqft	33,876	0.78

Notes:

1. Number of residential units and office space square footage were provided in the Prelimiary Project Assessment Application; acreage for residential space is the CalEEMod default acreage for mid-rise apartments with the specified number of units.

Abbreviations:

CalEEMod® - California Emissions Estimator Model®

Table 2
Estimated Criteria Air Pollutants Emissions from Proposed Project Construction
435 E 3rd Avenue Mixed-Use Project
San Mateo, CA

Summary of Construction Emissions by Source

Phase	Source	CAP Emissions[1]			
		ROG	NOx	PM_{10}	$PM_{2.5}$
		lb/yr			
Demolition	On-Site Exhaust	9.2	78	3.5	3.2
	Mobile Exhaust	0.09	5.15	0.19	0.08
	Fugitive Dust	0	0	0.54	0.08
Site Preparation	On-Site Exhaust	0.57	6.5	0.24	0.23
	Mobile Exhaust	0.01	0.35	0.01	0.01
	Fugitive Dust	0	0	0.06	0.01
Grading	On-Site Exhaust	1.3	15	0.60	0.55
	Mobile Exhaust	0.80	52	2.1	0.93
	Fugitive Dust	0	0	1.6	0.24
Building Construction	On-Site Exhaust	36	367	20	18
	Mobile Exhaust	8.5	439	15	6.8
	Fugitive Dust	0	0	57	8.5
Paving	On-Site Exhaust	1.5	13	0.62	0.57
	Mobile Exhaust	0.04	2.2	0.08	0.04
	Fugitive Dust	0	0	0.26	0.04
Architectural Coating	On-Site Exhaust	0	0	0	0
	Mobile Exhaust	0.12	6.8	0.26	0.11
	Fugitive Dust	0	0	0.64	0.10
	Architectural Coating	434	0	0	0

Average Construction Emissions by day

Year	ROG	NOx	PM_{10} (Exhaust)	$PM_{2.5}$ (Exhaust)
	lb/day			
2022	4.0	8.0	0.35	0.25
BAAQMD Thresholds	54	54	82	54

Notes:

1. Construction emissions were estimated with methodology equivalent to CalEEMod® 2020.4.0. On-Site Exhaust represents emissions from offroad equipment, while mobile exhaust includes emissions from worker, vendor, and hauling trucks. For PM, the construction emissions of fugitive dust include the entrained roadway dust.
2. Carbon dioxide equivalent emissions were determined using IPCC 5th Assessment Report Global Warming Potentials for CH_4 and N_2O.
3. Thresholds are from BAAQMD Guidance for Assessing and Mitigating Air Quality Impacts. For PM, this includes construction exhaust and fugitive emissions.

Abbreviations:

BAAQMD - Bay Area Air Quality Management District
CalEEMod® - California Emissions Estimator Model®
CAP - Criteria Air Pollutants
CEQA - California Environmental Quality Act
NOx - nitrogen oxides
PM_{10} - particulate matter less than 10 microns
$PM_{2.5}$ - particulate matter less than 2.5 microns
ROG - reactive organic gases

References:

California Emissions Estimator Model (CalEEMod). 2020.4.0. CAPCOA. 2020. Available online at: http://www.caleemod.com

Table 3
Maximum Project Excess Lifetime Cancer Risk, Chronic HI and PM2.5
435 E 3rd Avenue Mixed-Use Project
San Mateo, CA

Source Category	Project Construction					
	Off-Site Resident			Off-Site Daycare Child		
	Excess Lifetime Cancer Risk[1]	Chronic HI	Annual average $PM_{2.5}$	Excess Lifetime Cancer Risk[1]	Chronic HI	Annual average $PM_{2.5}$
	in a million	unitless ratio	$\mu g/m^3$	in a million	unitless ratio	$\mu g/m^3$
Off-road construction equipment exhaust	7.21	0.03	0.04	0.59	0.003	0.005
On-road construction mobile vehicles	0.02	0.0001	0.0001	0.01	0.00005	0.0001
Total	**7.2**	**0.03**	**0.04**	**0.6**	**0.003**	**0.005**
Significance Threshold	**10**	**1**	**0.3**	**10**	**1**	**0.3**
Exceed threshold?	**No**	**No**	**No**	**No**	**No**	**No**
UTMx	559920			560160		
UTMy	4157980			4157860		

Note:

1. Excess lifetime cancer risk and chronic HI from construction sources represent the incremental increase in activity expected as a result of the Project.
2. Excess lifetime cancer risks were estimated using the following equation:
   $Risk_{inh} = \Sigma C_i \times CF \times IF_{inh} \times CPF_i \times ASF$
   Where:
   $Risk_{inh}$ = Cancer Risk for the Inahalation Pathway (unitless)
   C_i = Annual Average Air Concentration for Chemical "i" ug/m^3
   CF = Conversion Factor (mg/ug)
   IF_{inh} = Intake Factor for Inhalantion (m^3/kg-day)
   CPF_i = Cancer Potency Factor $(mg/kg\text{-}day)^{-1}$
   ASF = Age Sensitivity Factor (unitless)
3. Chronic HI for each receptor was estimated using the following equation:
   $HI_{inh} = \Sigma C_i / cREL$
   Where:
   HI_{inh} = Chronic HI for the Inhalation Pathway (unitless)
   C_i = Annual Average Air Concentration for Chemical "i" (ug/m^3)
   cREL = Chronic Reference Exposure Level (ug/m^3)

Abbreviations:

µg - microgram
OEHHA - Office of Environmental Health Hazard Assessment
m^3 - cubic meter
PM - particulate matter

Reference:

BAAQMD. 2017. California Environmental Quality Act Air Quality Guidelines. May. Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf.pdf?la=en

OEHHA. 2015. Air Toxics Hot Spots Program Risk Assessment Guidelines. Guidance Manual for Preparation of Health Risk Assessments. February.

Table 4
Construction Cumulative Risks and Hazards
435 E 3rd Avenue Mixed-Use Project
San Mateo, CA

Receptor Type	Source[1]	Lifetime Excess Cancer Risk[1] (in a million)	Noncancer Chronic HI[1]	$PM_{2.5}$ Concentration[1] ($\mu g/m^3$)
Off-Site Resident	Stationary Sources[2]	4.9	0.02	9.3E-05
	Highway[3]	7.4	--	0.16
	Major Streets[3]	0.15	--	3.8E-03
	Railways[2]	54	--	0.10
	Project Construction	7.2	2.9E-02	4.4E-02
	Total	**73**	**0.05**	**0.31**
	Exceeds Threshold?	**NO**	**NO**	**NO**
Off-Site Daycare Child	Stationary Sources[2]	20	0.09	1.8E-03
	Highway[3]	7.9	--	0.17
	Major Streets[3]	0.15	--	3.8E-03
	Railways[3]	33	--	0.10
	Project Construction	0.60	3.1E-03	4.8E-03
	Total	**61**	**0.09**	**0.28**
	Exceeds Threshold?	**NO**	**NO**	**NO**
On-Site Resident	Stationary Sources[2]	7.1	0.03	5.3E-04
	Highway[3]	7.5	--	0.16
	Major Streets[3]	0.15	--	3.8E-03
	Railways[3]	58	--	0.16
	Total	**72**	**0.03**	**0.32**
	Exceeds Threshold?	**NO**	**NO**	**NO**
	Threshold	**100**	**10**	**0.8**

Notes:

[1] If the cell is marked with "--", no risk was calculated. For existing stationary sources, this is because the source was more than 1,000 feet from the identified sensitive receptors. For roadways, the chronic HI is not calculated in the BAAQMD screening tool.

[2] Stationary sources include existing stationary sources and foreseeable future stationary sources.

[3] Cancer risk and $PM_{2.5}$ concentration values were determined using BAAQMD screening tools and are based on the maximum impact of a raster cell located on the identified sensitive receptors.

Abbreviations:

µg - microgram
HI - hazard index
m^3 - cubic meter
$PM_{2.5}$ - fine particulate matter

References:

Bay Area Air Quality Management District (BAAQMD). 2020. Permitted Sources Risk and Hazards Map. June. Available at: https://baaqmd.maps.arcgis.com/apps/webappviewer/index.html?id=2387ae674013413f987b1071715daa65

Bay Area Air Quality Management District (BAAQMD). 2020. Health Risk Calculator Beta 4.0. March. Available at: https://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/tools/baaqmd-health-risk-calculator-beta-4-0-xlsx.xlsx?la=en&rev=dab7d85a772d45caa9c99e59395bf12d\

BAAQMD. 2022. Personal Communication from Matthew Hanson to Carlos Ciudad-Real. March 25.

Ramboll. 2022. CEQA Air Quality and Health Risk Assessment for the Block 21 Mixed-Use Project, San Mateo, California (Draft). April 1.

Table 5
Construction Phasing Schedule
435 E 3rd Avenue Mixed-Use Project
San Mateo, CA

Phase	Start Date	End Date	Number of Work Days	Days per Week
Demolition	5/1/2022	5/13/2022	10	5
Site Preparation	5/14/2022	5/16/2022	1	5
Grading	5/17/2022	5/18/2022	2	5
Building Construction	5/19/2022	10/5/2022	100	5
Paving	10/6/2022	10/12/2022	5	5
Architectural Coating	10/13/2022	10/19/2022	5	5

Notes:

1. The construction schedule is based on CalEEMod default phases and durations, with construction beginning in Q2 2022.

Table 6
Construction Equipment
435 E 3rd Avenue Mixed-Use Project
San Mateo, CA

Phase	Equipment[1]	CalEEMod Equipment[2]	Fuel[3]	Number[1]	Horsepower[1]	Daily Usage[4] (hours/day)	Utilization	Unmitigated Tier[5]
Demolition	Concrete/Industrial Saws	Concrete/Industrial Saws	Diesel	1	81	8	100%	No Specific Tier
	Rubber Tired Dozers	Rubber Tired Dozers	Diesel	1	247	1	100%	No Specific Tier
	Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	6	100%	No Specific Tier
Site Preparation	Graders	Graders	Diesel	1	187	8	100%	No Specific Tier
	Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	8	100%	No Specific Tier
Grading	Graders	Graders	Diesel	1	187	6	100%	No Specific Tier
	Rubber Tired Dozers	Rubber Tired Dozers	Diesel	1	247	6	30%	No Specific Tier
	Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	7	100%	No Specific Tier
Building Construction	Cranes	Cranes	Diesel	1	231	4	45%	No Specific Tier
	Forklifts	Forklifts	Diesel	2	89	6	80%	No Specific Tier
	Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	2	97	8	45%	No Specific Tier
Paving	Cement and Mortar Mixers	Cement and Mortar Mixers	Diesel	4	9	6	100%	No Specific Tier
	Pavers	Pavers	Diesel	1	130	7	4%	No Specific Tier
	Rollers	Rollers	Diesel	1	80	7	4%	No Specific Tier
	Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	Diesel	1	97	7	100%	No Specific Tier
Architectural Coating	Air Compressors	Air Compressors	Diesel	1	78	6	100%	No Specific Tier

Notes:

1. Equipment lists were provided/confirmed by the Project Sponsor.
2. CalEEMod equipment types are assgined using CalEEMod User's Guide Appendix D.
3. All equipment is conservatively assumed to be diesel-fueled.
4. Construction activities are assumed to occur during 8AM to 8PM, consistent with San Mateo County guidelines.
5. Assumed fleet-average tier.

Abbreviations:

CalEEMod - California Emissions Estimator Model

References:

California Air Pollution Control Officers Association (CAPCOA). California Emissions Estimator Model (CalEEMod®), Version 2020.4.0. Available online at http://www.caleemod.com/

Table 7
Construction Trips
435 E 3rd Avenue Mixed-Use Project
San Mateo, CA

Phase	Year	Construction Days	Worker Trip Rates[1] (one-way trips/day)	Vendor Trip Rates[1] (one-way trips/day)	Hauling Trip Number[2] (one-way trips/phase)	Trip Lengths[3] (miles/one way trip)			Worker VMT (miles)	Vendor VMT (miles)	Hauling VMT (miles)
						Worker	Vendor	Hauling			
Demolition	2022	10	15	5	10	10.8	7.3	20	1,620	365	200
Site Preparation	2022	1	18	5	0	10.8	7.3	20	194	37	0
Grading	2022	2	15	5	310	10.8	7.3	20	324	73	6,200
Building Construction	2022	100	172	62	25	10.8	7.3	20	185,760	45,260	500
Paving	2022	5	15	4	5	10.8	7.3	20	810	146	100
Architectural Coating	2022	5	34	10	20	10.8	7.3	20	1,836	365	400

EMFAC Data[4]

Trip Type	EMFAC Settings	Fleet Mix	Fuel Type
Worker	San Mateo County Calendar Years 2022-2023 Annual Season Aggregated Model Year EMFAC2007 Vehicle Categories	50% LDA, 25% LDT1, 25% LDT2	Gasoline
Vendor		50% MHDT, 50% HHDT	Diesel
Hauling		100% HHDT	Diesel

Notes:

1. Worker and vendor trips during building construction is based on project land use areas and was scaled from default CalEEMod worker and vendor trips. Worker trips during architectural coating are equal to 20% of the building construction trips.
2. Hauling trip rates are calculated based on the import and export quantities provided by the Project Sponsor. Import and export quantities are converted from tons or cubic yards to corresponding one-way trips per phase by assuming 20 tons per truck or 16 cubic yards per truck. Default truck capacities are consistent with CalEEMod User's Guide Appendix A.
3. Trip lengths are based on CalEEMod Appendix D defaults for San Mateo County (urban).
4. Emissions were calculated using emission factors from EMFAC2021 Emissions Inventory with the specified settings and fleet and fuel assumptions.

Abbreviations:

CalEEMod - California Emissions Estimator Model
EMFAC2021 - California Air Resources Board EMission FACtor model
LDA - light-duty automobiles
LDT - light-duty trucks
HHDT - heavy-heavy duty trucks

References:

California Air Pollution Control Officers Association (CAPCOA). California Emissions Estimator Model (CalEEMod®), Version 2020.4.0. Available online at http://www.caleemod.com/
California Air Resources Board (ARB) 2021. EMFAC2021. Available at: https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/msei-modeling-tools

Table 8
Estimated Emissions from Construction Architectural Coating Off-Gassing
435 E 3rd Avenue Mixed-Use Project
San Mateo, CA

Inputs

Parameter		Input	Units
Residential Surface Area to Floor Area Ratio		2.7	
Non-Residential Surface Area to Floor Area Ratio		2.0	
Painted Area in Parking Structures		6%	
Application Rate		100%	
Fraction of Surface Area	Interior Surfaces	75%	
	Exterior Shell	25%	
Indoor Paint VOC Content		100	g/L
Outdoor Paint VOC Content		150	g/L

Emissions

Land Use[1]	CalEEMod® Land Use	Square Footage (square feet)	Building Surface Area (square feet)	Architectural Coating VOC emissions[2] (lb)
Residential Space	Apartments Mid Rise	5,663	15,290	80
Office Space	General Office Building	33,977	67,954	354
Total				**434**

Notes:

2. Calculated based on CalEEMod® assumption that 1 gallon of paint covers 180 square feet and that building area is assumed to be 75% indoors and 25% outdoors.

Abbreviations:

CalEEMod® - California Emissions Estimator Model
EF - Emission Factor
g - grams
L - liter
lb - pound
VOC - Volatile Organic Compound

References:

California Air Pollution Control Officers Association (CAPCOA). 2020. California Emissions Estimator Model (CalEEMod), Version 2020.4.0. Available online at http://www.caleemod.com/

Table 9
Silt Loading Emission Factors
435 E 3rd Avenue Mixed-Use Project
San Mateo, CA

Entrained Roadway Dust Constants for San Mateo County		
Roadway Category	**Silt Loading[1] (g/m^2)**	**Travel Fraction[1]**
Freeway	0.015	63%
Major	0.032	27%
Collector	0.032	5%
Local	0.32	5%
Weighted Silt Loading Factor	0.036	100%

Notes:

1. Travel fraction by roadway category and silt loading are from the ARB's Entrained Road Travel Emission Inventory Source Methodology, Tables 2 and 4, respectively.

Abbreviations:

ARB - Air Resources Board

g - gram(s)

m - meter

References:

California Air Resources Board. 2021. Miscellaneous Process Methodology 7.9, Entrained Road Travel, Paved Road Dust. March. Available online at: https://ww3.arb.ca.gov/ei/areasrc/fullpdf/2021_paved_roads_7_9.pdf

Table 10
Emission Factors for Entrained Roadway Dust
435 E 3rd Avenue Mixed-Use Project
San Mateo, CA

Road Dust Equation[1]

E [lb/VMT] = k*(sL)^0.91 * (W)^1.02 * (1-P/4N)

Parameters	Value
E = annual average emission factor in the same units as k	[calculated]
k = particle size multiplier for particle size range	
PM_{10} (lb/VMT)	0.0022
$PM_{2.5}$ (lb/VMT)	3.3E-04
sL = roadway silt loading [grams per square meter - g/m^2]	0.036
W = average weight of vehicles traveling the road [tons]	2.4
P = number of “wet” days in county with at least 0.01 in of precipitation during the annual averaging period	74
N = number of days in the averaging period	365

Entrained Road Dust Emission Factors	
PM_{10} Emission Factor [lb/VMT]	2.46E-04
$PM_{2.5}$ Emission Factor [lb/VMT]	3.69E-05

Notes:

1. Road dust equation and parameters are from the California Air Resources Board's (ARB) 2021 Miscellaneous Process Methodology 7.9 for Entrained Road Travel, Paved Road Dust. The silt loading emission factor assumes San Mateo county default roadway fractions and silt loading levels from ARB 2021. The number of "wet" days for San Mateo county is from ARB 2021. This is slightly higher than the default from CalEEMod® Appendix D Table 1.1 (70 days), which was based on older historic data and would result in slightly higher emissions. Other parameters (average weight of vehicles, size multipliers) are from ARB 2021. $PM_{2.5}$ is assumed to be 15% of PM_{10} based on paved road dust sampling in California (ARB Speciation Profile #471), which is a more representative fraction than provided in the older AP-42 fugitive dust methodology as discussed in ARB 2021 (page 10).

Abbreviations:

ARB - California Air Resources Board
CalEEMod® - California Emissions Estimator Model
EMFAC - EMission FACtor Model
g - gram
lb - pound
$PM_{2.5}$ - particulate matter less than 2.5 microns
PM_{10} - particulate matter less than 10 microns
VMT - vehicle miles traveled

References:

California Air Resources Board. 2021. Miscellaneous Process Methodology 7.9, Entrained Road Travel, Paved Road Dust. March. Available online at: https://ww3.arb.ca.gov/ei/areasrc/fullpdf/2021_paved_roads_7_9.pdf

California Air Pollution Control Officers Association (CAPCOA). 2020. California Emissions Estimator Model (CalEEMod), Version 2020.4.0. Available online at http://www.caleemod.com/

Table 11
Emission Factors for Entrained Roadway Dust
435 E 3rd Avenue Mixed-Use Project
San Mateo, CA

Entrained Road Dust Emission Factors
PM10 Emission Factor [lb/VMT]
PM2.5 Emission Factor [lb/VMT]

Phase	Construction Days	Total VMT (miles)	Total Emissions (lb)	
			PM10	PM25
Demolition	10	2,185	0.54	0.08
Site Preparation	1	231	0.06	0.01
Grading	2	6,597	1.62	0.24
Building Construction	100	231,520	57	8.5
Paving	5	1,056	0.26	0.04
Architectural Coating	5	2,601	0.64	0.10

Abbreviations:
lb - pound
VMT - vehicle miles travelled

Table 12
Modeled Emission Rates from Proposed Project Construction Sources
435 E 3rd Avenue Mixed-Use Project
San Mateo, CA

Phase	Year	Construction Emissions[1] [g/s]			
		Offroad		Onroad	
		DPM	$PM_{2.5}$	DPM	$PM_{2.5}$
		Cons	Cons	Onroad	Onroad
		DPM	PM25	DPM	PM25
Demolition	2022	1.0E-04	9.3E-05	1.0E-07	9.5E-08
Site Preparation	2022	7.0E-06	6.5E-06	8.3E-09	8.0E-09
Grading	2022	1.7E-05	1.6E-05	5.3E-07	5.1E-07
Building Construction	2022	5.7E-04	5.3E-04	1.0E-05	9.9E-06
Paving	2022	1.8E-05	1.6E-05	4.2E-08	4.0E-08
Architectural Coating	2022	1.8E-08	1.7E-08	1.2E-07	1.1E-07

Notes:

1. Construction TAC emissions were estimated from on-site off-road emissions, where all PM_{10} tailpipe emissions are assumed to be DPM (although a portion of this is likely not from diesel sources). On-road emissions from hauling and vendor vehicles were estimated using a modeled trip length of 0.65 miles. These emissions were modeled with the on-site construction sources rather than on separate haul roads. The inclusion of on-road emissions and decision to model these emissions onsite is conservative as the estimated traffic volumes do not exceed the screening levels recommended by BAAQMD (i.e., more than 5,000 vehicles per day and 500 trucks per day) and can be considered minor sources (BAAQMD 2011).

Abbreviations:

BAAQMD - Bay Area Air Quality Management District
CalEEMod® - California Emissions Estimator Model®
CAP - Criteria Air Pollutants
CEQA - California Environmental Quality Act
DPM - diesel particulate matter
$PM_{2.5}$ - particulate matter less than 2.5 microns

References:

California Emissions Estimator Model (CalEEMod). 2020.4.0. CAPCOA. 2020. Available online at: http://www.caleemod.com

California Environmental Quality Act (CEQA) Guidelines. 2017. Bay Area Air Quality Management District (BAAQMD). May. Available online at: http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf.pdf?la=en

Recommended Methods for Screening and Modeling Local Risks and Hazards. 2012. BAAQMD. May. Available online at: https://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/risk-modeling-approach-may-2012.pdf?la=en

Table 13
Construction Modeling Parameters
435 E 3rd Avenue Mixed-Use Project
San Mateo, CA

Construction Sources

Source[1]	Source Type	Number of Sources	Source Dimension		Release Height	Initial Vertical Dimension[3]	Initial Lateral Dimension[3]
			Value	Units	[m]	[m]	[m]
Construction Equipment	Area [2]	1	800	m^2	5	1.2	-
On-Road Haul Trucks	Volume	Multiple	Width of Road + 6	m	2.55	2.37	Source Dimension/2.15

Notes:

1. Modeled emission rates for emission sources are 1 g/s to generate unit dispersion factors. The complete AERMOD input file can be found in Appendix C.

2. Area source release height assumed to be 5 meters, consistent with SCAQMD LST Guidance.

3. According to USEPA's AERMOD guidance, initial vertical dimension of the modeled construction equipment area sources is the release hegith divided by 4.3. According to the USEPA Haul Road Guidance, the initial vertical dimension for line sources is the top of plume height divided by 2.15, where the top of the plume is equal to 2*Release Height. According to USEPA's AERMOD guidance, the initial horizontal dimension for construction volume sources is the source width divided by 2.15.

Abbreviations:

m - meter
m^2 - square meter
AERMOD - Atmospheric Dispersion Modeling
SCAQMD - South Coast Air Quality Management District
LST - Localized Significance Thresholds
USEPA - United States Environmental Protection Agency

References:

SCAQMD. 2008. Final Localized Significance Threshold Methodology. July. Available at: http://www.aqmd.gov/docs/default-source/ceqa/handbook/localized-significance-thresholds/final-lst-methodology-document.pdf?sfvrsn=2

United States Environmental Protection Agency (USEPA). 2012. Haul Road Workgroup Final Report Submission to EPA-OAQPS. U.S. EPA Office of Air Quality and Planning Standards, Research Triangle Park, North Carolina. Available at: https://www3.epa.gov/scram001/reports/Haul_Road_Workgroup-Final_Report_Package-20120302.pdf

USEPA. 2012. Haul Road Workgroup Final Report Submission to EPA-OAQPS. U.S. EPA Office of Air Quality and Planning Standards, Research Triangle Park, North Carolina. Available at: https://www3.epa.gov/scram001/reports/Haul_Road_Workgroup-Final_Report_Package-20120302.pdf

USEPA. 2019. User's Guide for the AMS/EPA Regulatory Model (AERMOD). U.S. EPA Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina. Available at: https://www3.epa.gov/ttn/scram/models/aermod/aermod_userguide.pdf

Table 14
Construction Exposure Parameters
435 E 3rd Avenue Mixed-Use Project
San Mateo, CA

Receptor Type	Receptor Age Group	Exposure Parameters						
		Daily Breathing Rate (DBR)[1]	Exposure Duration (ED)[2]	Fraction of Time at Home (FAH)[3]	Exposure Frequency (EF)[4]	Age Sensitivity Factor	Averaging Time (AT)	Intake Factor, Inhalation (IF_{inh})
		[L/kg-day]	[years]	[unitless]	[days/year]		[days]	[m^3/kg-day]
Resident	3rd Trimester	361	0.25	1	350	10	25500	0.012
	0-<2	1090	0.22	1		10		0.033
Daycare	0-<2	750	0.47	1	250	10		0.035
Childcare	2-<9	415	0.47	1		3		0.006

Notes:

1. Daily breathing rates reflect default breathing rates from OEHHA 2015 as follows:
   95th percentile moderate intensity 8-hour daily breathing rate for age 16-70
   9th percentile 8-hour daily breathing rate for age 0-2 years, assuming 2 hours of moderate intensity and 6 hours of light intensity activity

2 Exposure duration for residential receptor is assumed to begin at the start of construction and continue for the duration of the construction.

3 Fraction of time spent at home is conservatively assumed to be 1 (i.e., 24 hours/day) for age groups from the third trimester to less than 16 years old based on the recommendation from BAAQMD (BAAQMD 2016) and OEHHA (OEHHA 2015). The fraction of time at home for adults age 16-30 reflects default OEHHA guidance (OEHHA 2015) as recommended by BAAQMD (2016).

4 Exposure frequency reflects default exposure frequency from OEHHA 2015.

Calculation:

IF_{inh} = DBR * FAH * EF * ED * CF / AT

CF = 0.001 (m^3/L)

MAF = HR / HS * DR / DS *DF

Abbreviations:

AT - averaging time
BAAQMD - Bay Area Air Quality Management District
DBR - daily breathing rate
ED - exposure duration
EF - exposure frequency
FAH - fraction of time at home
HS - number of hours of source operation per day
DS - number of days of source operation per week
IF_{inh} - intake factor
kg - kilogram
L - liter
m^3 - cubic meter
OEHHA - Office of Environmental Health Hazard Assessment
MAH - model adjusmtent factor
HR - number of hours per day for which long-term concentration is calculated
DR - number of days per week for which annual average concentration is calculated
DF - discount factor, set to 1 because offsite worker's schedule falls entirely within the source schedule

References:

OEHHA. 2015. Air Toxics Hot Spots Program Risk Assessment Guidelines. Guidance Manual for Preparation of Health Risk Assessments. Available at https://oehha.ca.gov/media/downloads/crnr/2015guidancemanual.pdf

Table 15
Toxicity Values
435 E 3rd Avenue Mixed-Use Project
San Mateo, CA

Chemical[1]	Cancer Potency Factor $(mg/kg\text{-}day)^{-1}$	Chronic REL ($\mu g/m^3$)
Diesel PM	1.1	5.0

Notes:

1. Chemicals presented in this table reflect air toxic contaminants in the proposed fuel types that are expected from off-road equipment and on-road truck trips.

Abbreviations:

$\mu g/m^3$ - micrograms per cubic meter
ARB - Air Resources Board
Cal/EPA - California Environmental Protection Agency
$(mg/kg\text{-}day)^{-1}$ - per milligram per kilogram-day
OEHHA - Office of Environmental Health Hazard Assessment
PM - particulate matter
REL - reference exposure level

Reference:

Cal/EPA. 2015. OEHHA/ARB Consolidated Table of Approved Risk Assessment Health Values. May 13.

RAMBOLL

FIGURES

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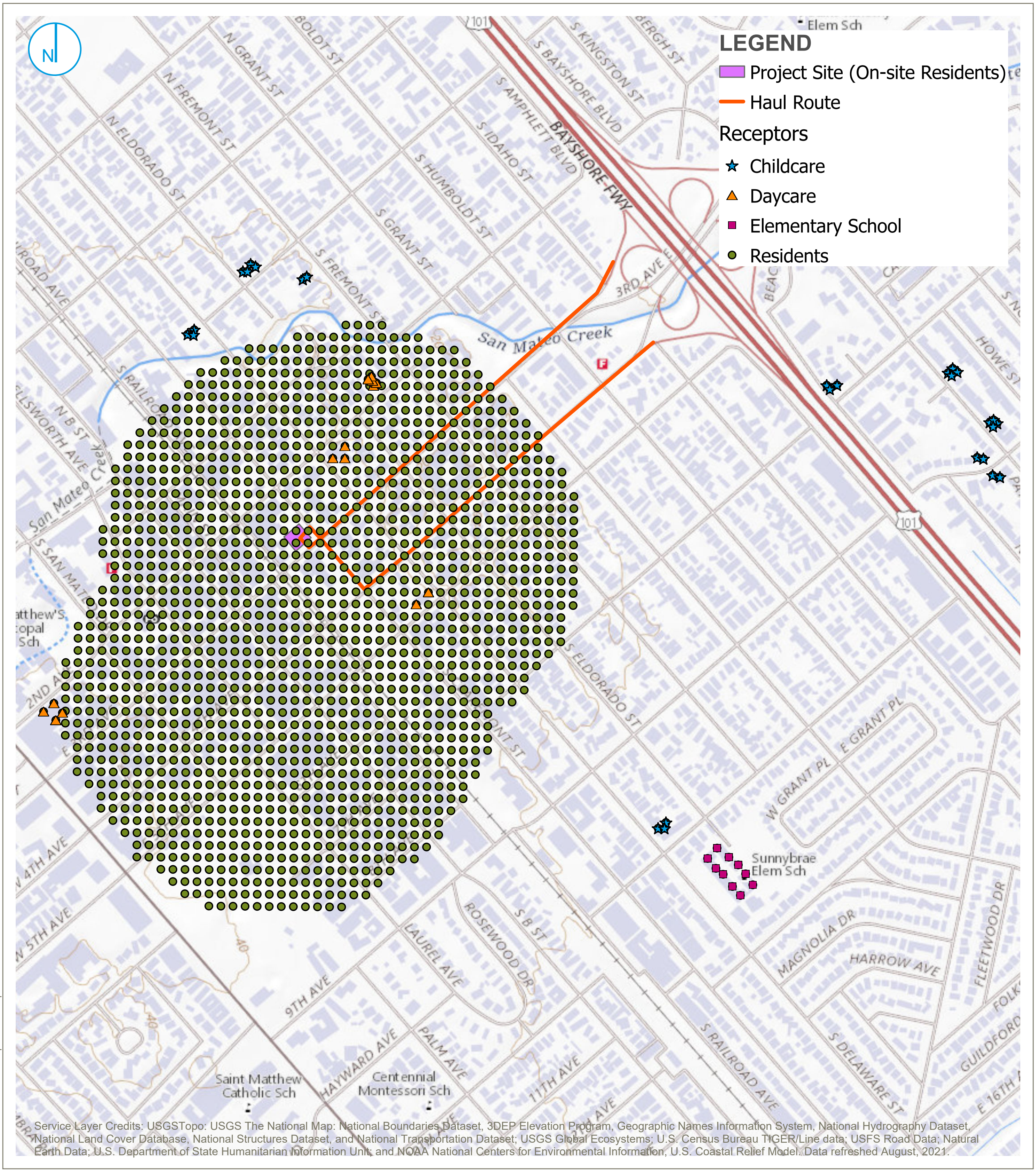


PROJECT: 1690002413 | DATED: | DESIGNER:

Map Scale: 1:11,000 | Map Center: 122°19'2"W 37°33'57"N

SOURCE AND RECEPTOR SETUP

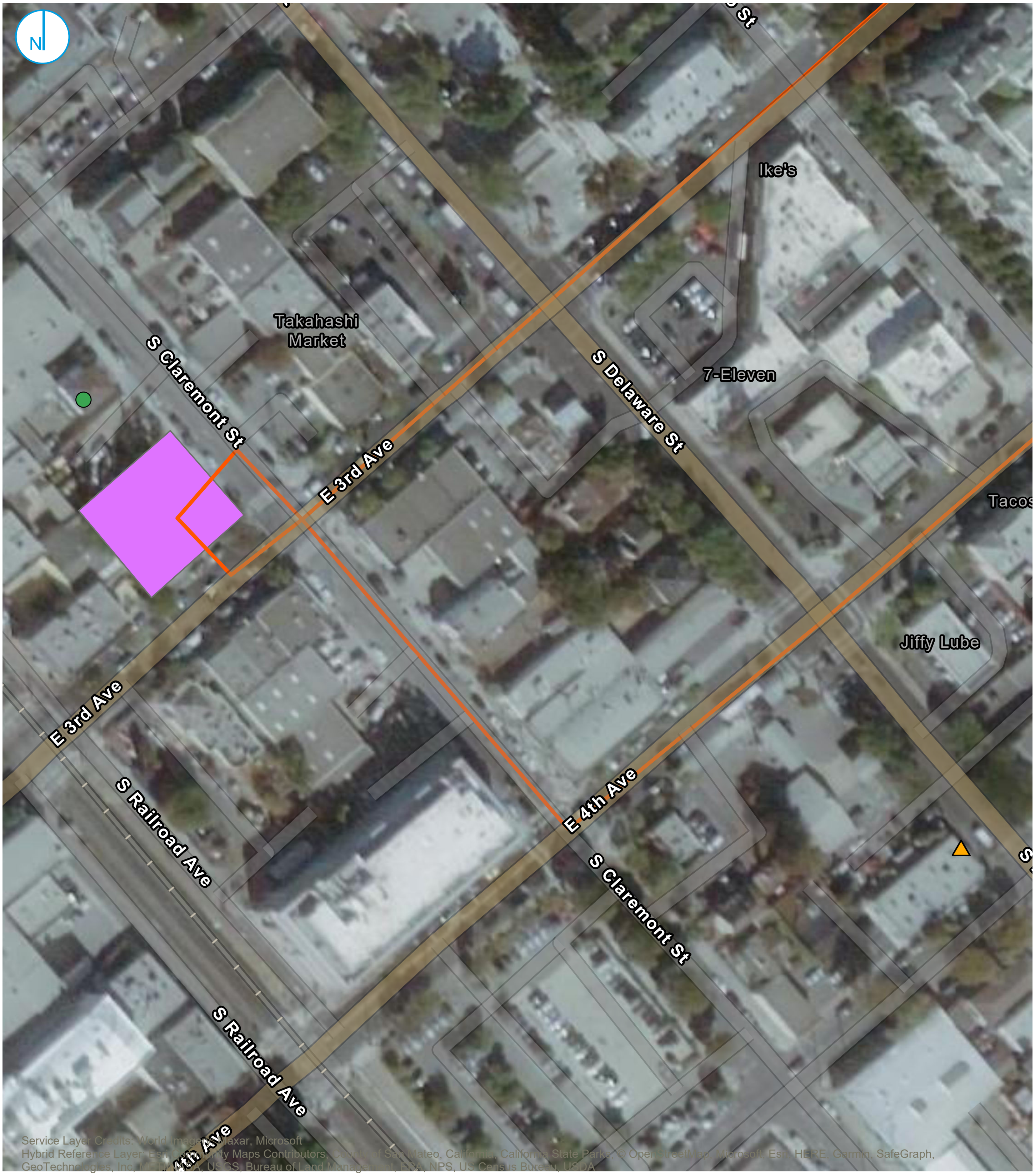
FIGURE 01

RAMBOLL US CONSULTING, INC.
A RAMBOLL COMPANY

435 E 3rd Avenue Mixed-Use Project
435 E 3rd Ave
San Mateo, CA

RAMBOLL

0 500 1,000 Feet



Map Scale: 1:1,845 | Map Center: 122°19'13"W 37°33'59"N

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PROJECT: 1690002413 | DATED: | DESIGNER:

LEGEND

Project Site (On-site Residents)

Haul Route

Receptors

Off-Site Daycare Child

Off-Site Resident

LOCATIONS OF MAXIMALLY EXPOSED INDIVIDUAL RESIDENT (MEIR) AND MAXIMALLY EXPOSED INDIVIDUAL STUDENT (MEIS)

435 E 3rd Avenue Mixed-Use Project

435 E 3rd Ave
San Mateo, CA

FIGURE 02

RAMBOLL US CONSULTING, INC.
A RAMBOLL COMPANY

0 500 1,000 Feet

APPENDIX A
TRAFFIC STUDY

435 E 3rd AVE TRIP GEN	assumes 100% existing uses occupied									
Land Use	ITE LU Code	Quantity	Units	Daily	AM			PM		
				Total	In	Out	Total	In	Out	Total
Proposed Project										
Multifamily Low-Rise	220	5	DU	34	0	2	2	2	1	3
General Office Building	710	34	KSF	454	58	8	66	12	56	68
				488	58	10	68	14	57	71
Reductions										
Internal Capture				-8	0	0	0	0	0	0
External Walk, Bike, and Transit				-91	-12	-1	-13	-3	-9	-12
				-20%	-21%	-10%	-19%	-21%	-16%	-17%
Proposed Project Subtotal				**389**	**46**	**9**	**55**	**11**	**48**	**59**
Existing Uses (average)										
Automobile Care Center	942	2.7	KSF	80	4	2	6	4	4	8
Reductions										
Internal Capture				0	0	0	0	0	0	0
External Walk, Bike, and Transit				0	0	0	0	0	0	0
				0%	0%	0%	0%	0%	0%	0%
Existing Uses Subtotal				**80**	**4**	**2**	**6**	**4**	**4**	**8**
Net new trips (Proposed project minus existing)				**309**	**42**	**7**	**49**	**7**	**44**	**51**

APPENDIX B
AERMOD INPUT FILES (PROVIDED ELECTRONICALLY)