Construction and Highway Health Risk Assessment for the Riverwalk Project San Diego, California

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August 2020

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Section 1
Introduction

The Riverwalk project site is currently developed with the Riverwalk Golf Course, which consists of three nine-hole courses; clubhouse building; driving range; and associated driveways, surface parking, and various maintenance and related facilities. The project site is in the Mission Valley Community Plan Area and a part of the current Levi-Cushman Specific Plan. The Levi-Cushman Specific Plan would be rescinded as part of the project actions and replaced with the Riverwalk Specific Plan as the land use regulations and policies for the project site. The site is zoned CC-3-9, RM-4-10, OP-1-1 and OC-1-1 as shown in Figure 1. The 2019 Mission Valley Community Plan designated the Project site as Riverwalk Specific Plan, with land uses of Residential (high density), Office and Visitor Commercial, and Potential Park/Open Space. The project site is designated Multiple Use; Commercial Employment, Retail, and Services; and Parks, Open Space, and Recreation in the City of San Diego General Plan.

The Riverwalk project would redevelop the existing golf course as a walkable, transit-centric, and mixed-use neighborhood that features a park along the San Diego River. The mix and quantity of land uses would include a maximum of 4,300 multi-family residential dwelling units; 152,000 square feet of commercial retail space; 1,000,000 square feet of office and non-retail commercial; approximately 95 acres of park, open space, and trails; adaptive reuse of the existing golf clubhouse into a community amenity; and a new Green Line Trolley stop within the development. Improvements to surrounding public infrastructure and roadways would be implemented as part of the Riverwalk project, including improvements to the Fashion Valley Road crossing of the San Diego River as a 10- to 15-year storm event crossing. The project would also include a habitat restoration effort on-site to create and/or enhance 25.16 acres of native habitats along the San Diego River, within and adjacent to the MHPA, and for a future wetland habitat mitigation bank.

AECOM understands that the Project will be developed in phases. Phase 1 will develop the western portion of the North District shown in Figures 2 and 3. Phase 2 will develop the eastern portion of the North District and the Central and Park Districts. Phase 3 will develop the South District. The project plans to construct the phases in sequential order. However, based on recommendation from the project contractor, Clark Construction, industry best practice is to overlap the sitework (i.e., demolition, site preparation and grading) portion of future phases while earlier phases are under construction. This scenario, the “Overlapping Scenario” is the likely buildout of the project, and phases the project accordingly: Phase 1 2021 – 2025, Phase 2 2024 – 2030, and Phase 3 2030 – 2034). However, this Health Risk Assessment (HRA) also analyzes construction under a scenario where overlapping does not occur ("Sequential Scenario"). The phases for the sequential scenario occur accordingly: Phase 1 2021 – 2025, Phase 2 2026 – 2030, and Phase 3 2031 – 2035.

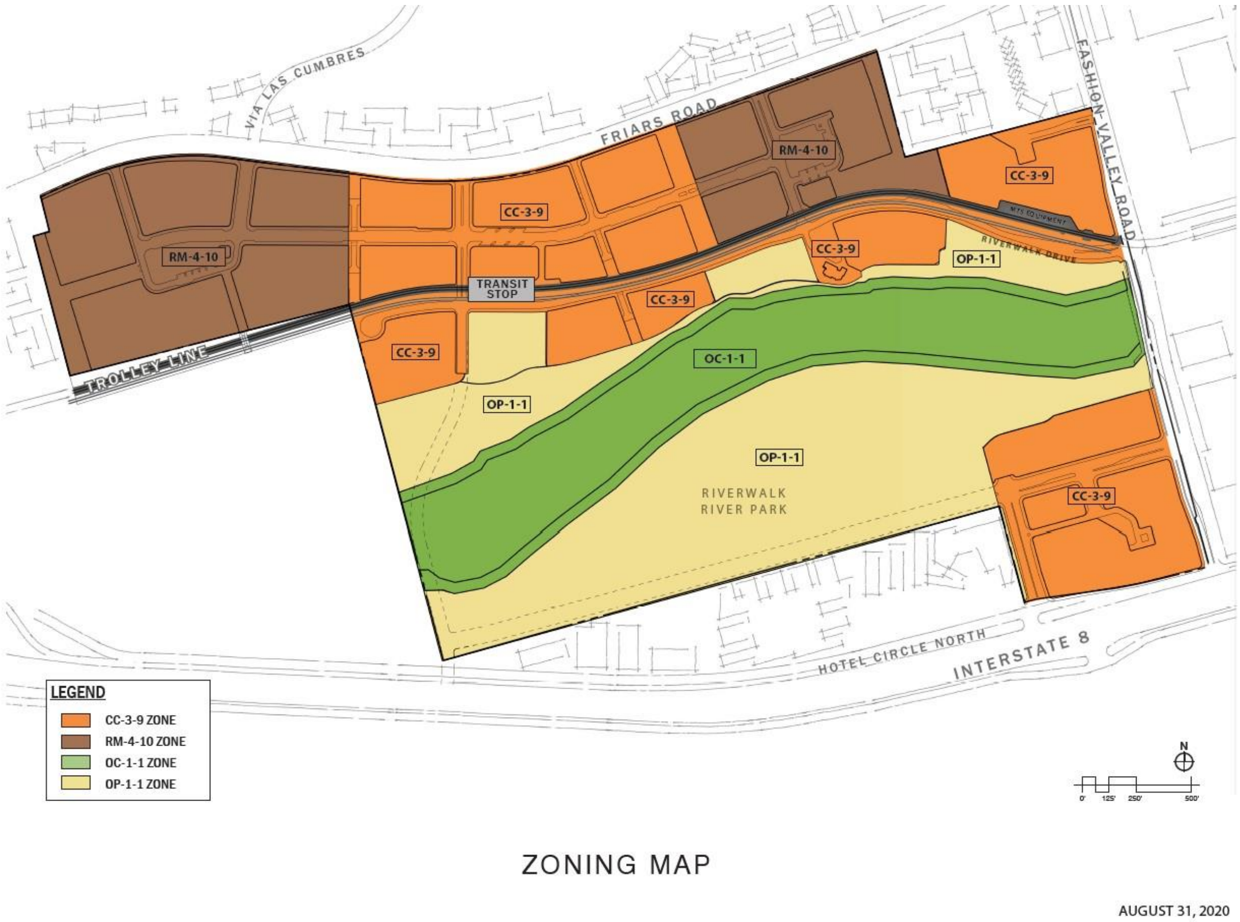


Figure 1 Riverwalk Zoning Map

Construction would generate emissions of toxic air contaminants (TACs) such as diesel Particulate Matter (PM), from a variety of sources including off-road construction equipment and on-road vehicles. This HRA evaluates emissions of diesel PM (assumed to be equivalent to $PM_{2.5}$ exhaust) from construction activities at on- and off-site sensitive receptor locations within ¼ mile of the Project construction areas.

The South District is zoned to CC-3-9, a zoning that allows for office, retail and residential development. The South District of the Project is situated on the northwest corner of Hotel Circle North and Fashion Valley Road, approximately 50 feet north of the Interstate-8 (I-8). Figure 4 shows the Project vicinity map.

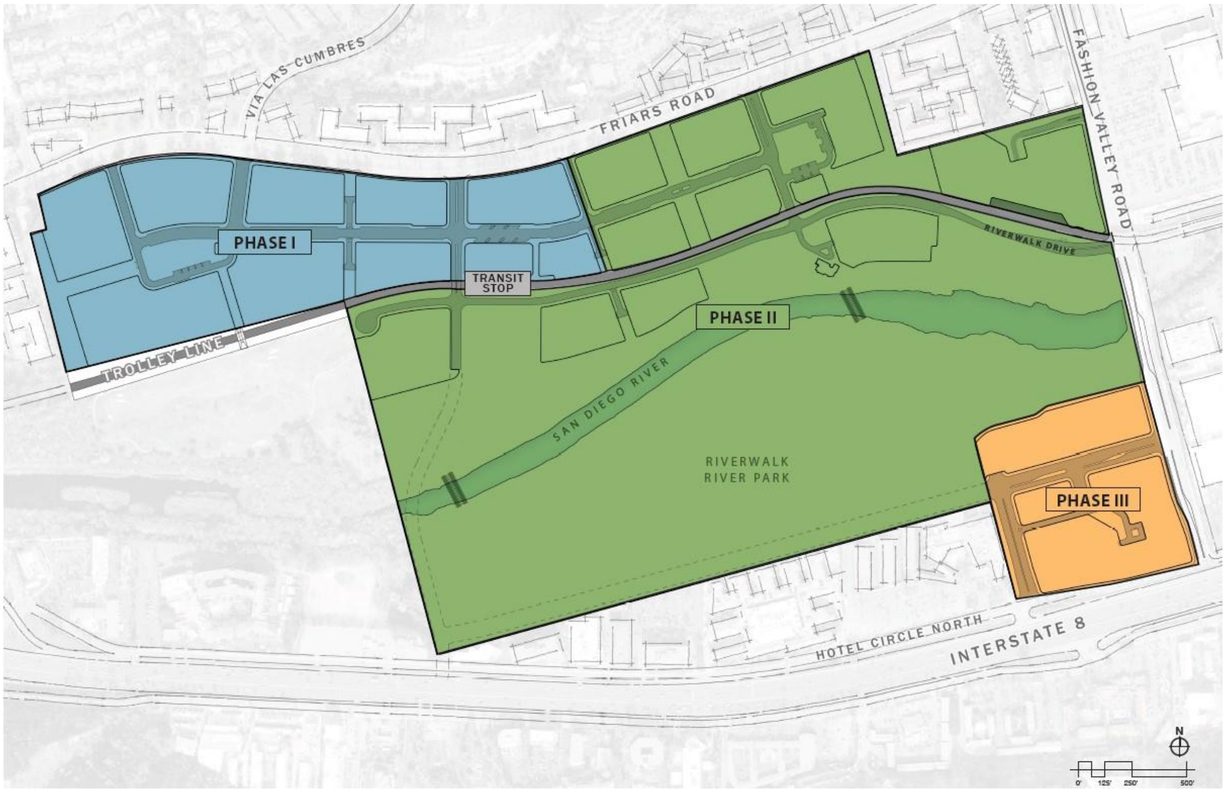


Figure 2 Riverwalk Phasing Map

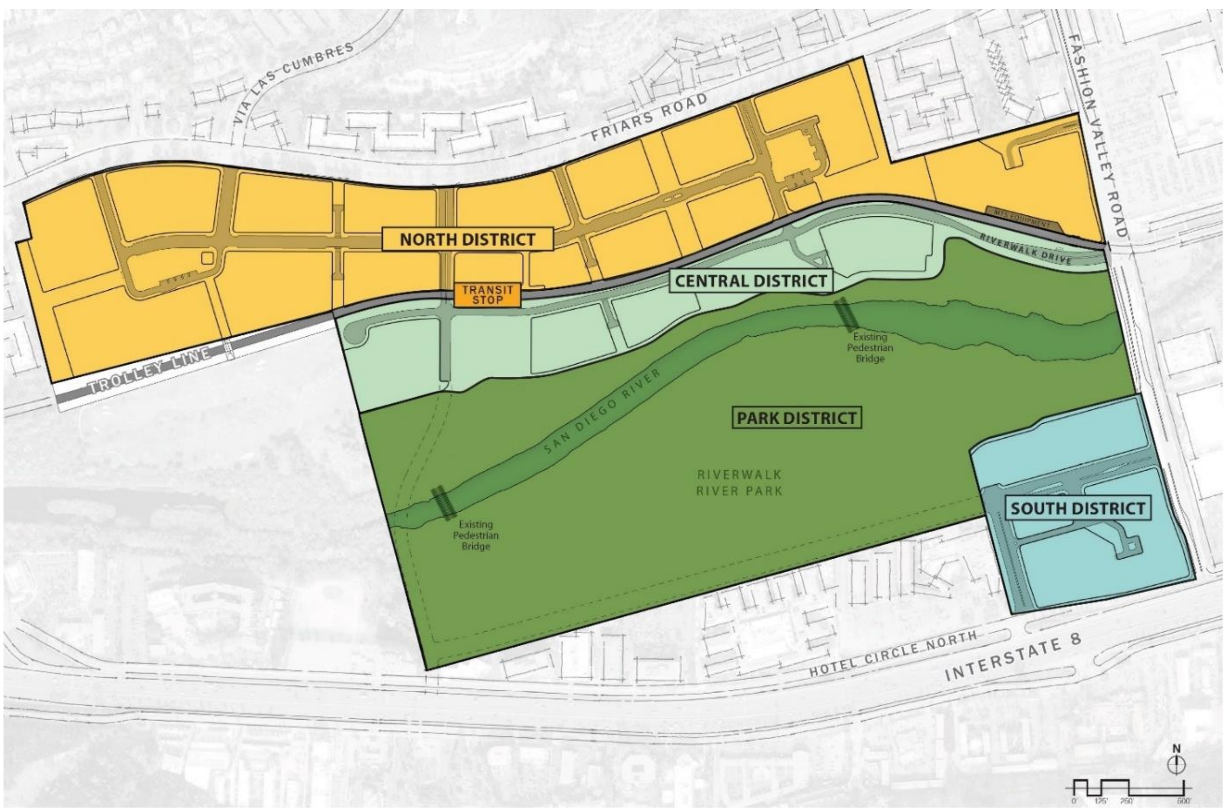


Figure 3 Riverwalk District Map

Freeways, including I-8, are sources of listed TACs in the State of California. The California Air Resources Board (ARB) published the *Air Quality and Land Use Handbook: A Community Health Perspective* (*Air Quality and Land Use Handbook*), which recommends that projects avoid siting new sensitive land uses, such as residences, within 500 feet of a freeway (ARB 2005). The recommendation is based on studies showing that pollutant concentrations decline with distance away from the source of the emissions. In response to new research demonstrating benefits of compact infill development along transportation corridors, ARB released a technical supplement, *Technical Advisory: Strategies to Reduce Air Pollution Exposure Near High-Volume Roadways* (*Technical Advisory*), to the 2005 *Air Quality and Land Use Handbook* (ARB 2017). This *Technical Advisory* was developed to identify strategies that can be implemented to reduce exposure at specific developments or as recommendations for policy and planning documents. It is important to note that it is not intended as guidance for a specific project and does not discuss the feasibility of mitigation measures for the purposes of compliance with CEQA. The benefits of compact, infill development along transportation corridors include encouragement for physical activity by facilitating active transportation, such as biking and walking; density of development that helps support transit operations; and reduction in greenhouse gas emissions associated with the car trips that are shortened or replaced by other modes of transportation. Some of the strategies identified in the *Technical Advisory* include design that promotes air flow and pollutant dispersion along street corridors, solid barriers, vegetation for pollutant dispersion, and indoor high efficiency filtration (ARB 2017).

Since a portion of the South District of the Project site would be located within the 500-foot distance recommended by the ARB handbook and technical advisory, AECOM has prepared a highway HRA to evaluate the health risks specifically from the adjacent freeway-related traffic emissions from vehicles traveling on I-8 on the potential future residences in the South District. This technical study summarizes the health risk findings which are based on estimated emissions from traffic along I-8. Possible residential locations beyond the area analyzed would have diminished risk from traffic emissions generated by vehicles traveling along I-8 and would not be of concern relative to health risk.

AERMOD View - Lakes Environmental Software C:\Projects\Riverwalk_HRA\Lakes\SDRiverwalk\SDRiverwalk.isc

Figure 4 Project Vicinity Map

Section 2
Properties, Effects, and Sources of Toxic Air Contaminants and Criteria Pollutants

2.1 Toxic Air Contaminants

TACs may be emitted by stationary, area, or mobile sources and are regulated under California law. Common stationary sources of TAC emissions include gasoline stations, dry cleaners, and diesel backup generators, which are subject to local air district permit requirements. The other, often more significant, sources of TAC emissions are motor vehicles on freeways, high-volume roadways, or other areas with high numbers of diesel vehicles, such as distribution centers. Off-road mobile sources are also major contributors of toxic air contaminant emissions and include construction equipment, locomotives, and marine engines.

TACs can be separated into carcinogens (cancer-causing substances) and noncarcinogens based on the nature of the effects associated with exposure to the pollutant. For regulatory purposes, carcinogens are assumed to have no safe threshold below which health impacts would not occur and cancer risk is expressed as excess cancer cases per 10 million exposed individuals (SDAPCD 2019). Noncarcinogens differ in that there is generally assumed to be a safe level of exposure below which no negative health impact is believed to occur. These levels are determined on a pollutant-by-pollutant basis. Acute and chronic exposure to noncarcinogens is expressed using a Hazard Index (HI), which is the ratio of expected exposure levels to acceptable health-acceptable exposure levels.

Based on the results of a 1998 study by the State of California Office of Environmental Health Hazard Assessment (OEHHA), particulate exhaust emissions from diesel-fueled engines (diesel PM) were identified as a TAC by the State of California Air Resources Board (ARB) based on its potential to cause cancer. Other agencies, such as the National Toxicology Program, the U.S. Environmental Protection Agency and the National Institute of Occupational Safety and Health, concluded that exposure to diesel exhaust likely causes cancer. The most recent assessment (2012) came from the World Health Organization’s International Agency for Research on Cancer (ARB 2020). Federal and state efforts to reduce diesel PM emissions have focused on the use of improved fuels, adding particulate filters to engines, and requiring the production of new-technology engines that emit fewer exhaust particulates.

Diesel engines tend to produce a much higher ratio of fine particulates than other types of internal combustion engines. The fine particles that make up diesel PM tend to penetrate deep into the lungs and the rough surfaces of these particles makes it easy for them to bind with other toxins within the exhaust, thus increasing the hazards of particle inhalation. Long-term exposure to diesel PM is known to lead to chronic, serious health problems including cardiovascular disease, cardiopulmonary disease, and lung cancer.

2.2 Criteria Air Pollutants

In addition to TACs, and as described in more detail in Appendix F (Air Quality Study Birdseye Planning Group, LLC August 2020) to the Riverwalk Environmental Impact Report (EIR), the federal and California Clean Air Act establish ambient air quality standards for six major air pollutants: ozone, carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), lead, and particulate matter (PM). PM is subdivided into two classes based on particle size: PM equal to or less than 10 micrometers in diameter (PM_{10}) and PM equal to or less than 2.5 micrometers in diameter ($PM_{2.5}$). The Clean Air Act identifies two types of National Ambient Air Quality Standards (NAAQS): primary and secondary. Primary standards provide public health protection, including protecting the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. Because the NAAQS for these air pollutants are regulated using human health and environmentally based criteria, they are commonly referred to as "criteria air pollutants." Please refer to Appendix F (Air Quality Study to the Riverwalk EIR) for a detailed description of the health risks and sources of criteria air pollutants.

2.3 Sensitive Receptors

Some members of the population are especially sensitive to air pollutant emissions and should be given special consideration when evaluating air quality impacts from projects. These include children, the elderly, people with preexisting respiratory or cardiovascular illness, and athletes and others who engage in frequent exercise. Air quality regulators typically define sensitive receptors as schools, hospitals, resident care facilities, day-care centers, or other facilities that may house individuals with health conditions that would be adversely impacted by changes in air quality. Residential areas are also considered sensitive to air pollution because residents (including children and the elderly) tend to be at home for extended periods of time, resulting in sustained exposure to pollutants present.

Construction of the Project will expose nearby residences to TACs and as such the residences within 1,000 feet of the Project were modeled to determine exposure of diesel PM from construction activities for the entire duration of the Project (2021 through 2034 for the overlapping scenario or 2035 for the sequential scenario). In addition, the proposed on-site dwelling units were assumed to be occupied as construction of Phase 1 and Phase 2 are completed. The residences constructed in Phase 1 of the Project were assumed to be occupied in 2026 and were modeled to determine exposure for the remaining construction years. The residences constructed as part of Phase 2 of the Project were assumed to be occupied in 2031 and were modeled to determine exposure for the remaining construction years.

As stated previously, the South District of the Project site is zoned CC-3-9, a zone which allows for residential use, as well as commercial uses (such as retail and office space). The project does not designate residential use in this area. However, since the zoning allows for residential uses, AECOM has conservatively assumed residences would be located across the entire South District of the site for the highway HRA.

Section 3
Analysis of Health Risks

3.1 Thresholds of Significance for Health Risks

Since the City of San Diego has not established significance thresholds for health risk, consistent with the San Diego Air Pollution Control District (SDAPCD) Supplemental Guidelines for Submission of Air Toxics "Hot Spots" Program for HRAs, Rule 1210 public notification and significant risk levels were utilized (SDAPCD 2019):

- The Project would be considered to result in an adverse Health Risks related to TAC emissions if it specifically would result in exposure of sensitive receptors to TACs in a manner that cause:
  - excess cancer risk levels of more than 10 in 1 million;
  - and a chronic HI greater than 1.0

3.2 Methodology for the Construction and Highway HRA

The refined assessments were performed to evaluate the potential residential receptor exposure to diesel PM associated with construction of the Project and vehicle emissions from I-8 at potential new residences in the South District of the Project. As discussed above, diesel PM is a TAC emission from vehicles, including diesel-powered heavy-duty trucks and light-duty vehicles (including automobiles).

Emission Estimates for Construction HRA

Construction-related health impacts were based on the amount of on-site emissions generated by off-road (i.e., construction) equipment and on-road equipment (i.e., hauling, vendor, and worker trips) generated within ¼-mile of the Project site. Construction-related emission estimates were based on Appendix F (Air Quality Study to the Riverwalk EIR) for use in the Construction HRA. The analysis in Appendix F (Air Quality Study to the Riverwalk EIR), used CalEEMod Version 2016.3.2. CalEEMod allows the user to enter project-specific construction information, such as types, number, and horsepower of construction equipment, and number and length of off-site motor vehicle trips. CalEEMod incorporates ARB's OFFROAD 2011 emissions inventory and EMFAC 2014 emissions database, to estimate off-road and on-road construction equipment emissions.

Both EPA and the State of California have set emissions standards for new off-road equipment engines, ranging from Tier 1 to Tier 4. Tier 1 emission standards were phased in between 1996 and 2000, and Tier 4 interim and final emission standards for all new engines were phased in between 2008 and 2015. For this analysis, it was assumed that all construction equipment with engines greater than 50 horsepower would at a minimum utilize Tier 3 emission standards with Tier 3 particulate filters. This is a requirement of the Riverwalk Specific Plan (Reg-132) and shall be incorporated into the Project.

Reg-132 Construction contractors shall use equipment that meets, at a minimum, the ARB's and/or EPA's Tier 3 emissions standards with Tier 3 diesel particulate filters (DPF) for off-road diesel-powered construction equipment with more than 50 horsepower for all construction activities, unless it can be demonstrated to the City of San Diego that such equipment is not available. Documentation shall consist of signed written statements from at least two construction equipment rental firms. Any emissions control device used by the contractor shall achieve emissions reductions that are no less than what could be achieved by Tier 3 with Tier 3 DPF emissions standard for a similarly sized engine, as defined by ARB or EPA regulations. For any substitute emissions control device employed, the contractor shall provide documentation that the associated emissions reductions are no less than what could be achieved by Tier 3 engine with Tier 3 DPF emissions standards for a similarly sized engine.

Exhaust $PM_{2.5}$ (a surrogate for diesel PM) from the off-road and on-road construction equipment were used to estimate construction-related health risks. Since construction-related health risks were analyzed under two scenarios (overlapping and sequential) and vary by construction activities and year, there are different exhaust $PM_{2.5}$ emissions associated with each year of construction. The demolition, site preparation, and grading emissions for Phase 2 were divided into two areas by acreage, north and south of the San Diego River. The northern area will include mixed-use development, whereas south of the San Diego River will be a park. The building construction, architectural coatings and paving emissions were assigned to the north area only. Tables 1 and 2 below shows the estimated off-road exhaust $PM_{2.5}$ emissions (in pounds per year) associated with each year of construction under each scenario, respectively. The HRA conservatively assumed that the highest year of emissions in each group (i.e. Phase 1 only, Phase 1 and 2 overlap, Phase 2 only, Phase 2 and 3 overlap, and Phase 3 only for the overlapping scenario) could occur for all years in that group.

Mobile-source emissions for construction vehicles and worker trips were estimated using CalEEMod and project-specific data. As noted above, $PM_{2.5}$ exhaust was assumed to be diesel PM and construction-worker and material delivery vehicles were estimated based on the default

CalEEMod fleet mix for projects in San Diego County. CalEEMod defaults for worker and haul truck trip distances were used. Daily worker trips were estimated based on input from the construction contractor. Haul truck trip quantities were estimated based on the anticipated material import and demolition off-haul quantities, based on a haul truck capacity of 20 cubic yards. The CalEEMod emissions were scaled by trip length within the modeling domain divided by CalEEMod trip distance to determine the amount of emissions within the modeling domain of the Project. The vehicle emissions used in the HRA are summarized in Tables 3 and 4.

Emission Estimates for Highway HRA

ARB's on-road emissions inventory model, EMFAC 2017, was used to develop emission factors by pollutant, vehicle type, fuel type, and average speed in the Project area for the San Diego County vehicle population. Average daily trip estimates on the I-8 freeway were obtained from Appendix L, Mobility Assessment, of the Riverwalk Draft EIR (LLG 2020) for the 2035 Project Buildout year, which assumes buildout of the South District in 2035. Since there is some flexibility for ultimate buildout year of Phase III, the analysis conservatively assumed the 2025 calendar year as the first year of operations. Given that emissions from on-road medium and heavy-duty vehicles are expected to decrease over time as stricter standards take effect, assuming a 2025 opening year would generate conservative estimates. If the opening year were to occur in later years, advancements in engine technology, retrofits, and turnover in the San Diego average vehicle fleet are anticipated to result in lower levels of emissions. Therefore, using the earliest year of operations provides the most conservative estimate of emissions and potential health risks.

The assumptions for the fleet mix, including the breakout between heavy-duty trucks and light-duty automobiles, were obtained from California Department of Transportation (Caltrans) Traffic Volumes and Annual Average Daily Truck Traffic on I-8 (Caltrans 2018). The average daily traffic counts were multiplied by the appropriate roadway distances within 1,000 feet of the Project site to obtain representative vehicle miles traveled (VMT) (approximately 0.53 mile) for the Project area. The fuel type assumptions, including the percentage of diesel-fueled trips, were obtained from EMFAC 2017 fleet mix for San Diego County. Total $PM_{2.5}$ running exhaust (a surrogate for diesel PM) emissions were estimated based on annual vehicle trips and VMT for the Project area.

Table 1 Construction PM2.5 Exhaust Emissions (pounds/year) by Year for Overlapping Scenario[1]

Phase	Category	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
1	Onsite	**102.69**	94.41	71.72	**71.89**	71.25	-	-	-	-	-	-	-	-	-
1	Hauling	26.50	2.93	0.00	0.00	0.00	-	-	-	-	-	-	-	-	-
1	Vendor	3.46	22.86	11.09	10.83	9.83	-	-	-	-	-	-	-	-	-
1	Worker	4.32	28.30	27.59	30.25	30.27	-	-	-	-	-	-	-	-	-
2 N	Onsite	-	-	-	7.67	**26.92**	**42.05**	42.05	42.05	30.80	9.20	-	-	-	-
2 S	Onsite	-	-	-	8.55	**29.99**	-	-	-	-	-	-	-	-	-
2	Hauling	-	-	-	4.70	4.02	-	-	-	-	-	-	-	-	-
2	Vendor	-	-	-	-	-	21.87	21.38	20.96	13.19	-	-	-	-	-
2	Worker	-	-	-	0.09	0.25	46.46	43.93	40.69	31.85	7.03	-	-	-	-
3	Onsite	-	-	-	-	-	-	-	-	-	**145.20**	**58.07**	58.07	41.20	8.38
3	Hauling	-	-	-	-	-	-	-	-	-	6.95	-	-	-	-
3	Vendor	-	-	-	-	-	-	-	-	-	7.09	7.10	6.99	4.51	-
3	Worker	-	-	-	-	-	-	-	-	-	8.27	7.60	7.07	4.77	1.16

[1]Bolded values used in HRA modeling.

Table 2 Construction PM2.5 Exhaust Emissions (pounds/year) by Year for Sequential Scenario[1]

Phase	Category	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
1	Onsite	**102.69**	94.41	71.72	**71.89**	71.25	-	-	-	-	-	-	-	-	-	
1	Hauling	26.50	2.93	0.00	0.00	0.00	-	-	-	-	-	-	-	-	-	
1	Vendor	3.46	22.86	11.09	10.83	9.83	-	-	-	-	-	-	-	-	-	
1	Worker	4.32	28.30	27.59	30.25	30.27	-	-	-	-	-	-	-	-	-	
2 N	Onsite	-	-	-	-	-	24.46	**50.21**	42.05	44.22	33.26	-	-	-	-	
2 S	Onsite	-	-	-	-	-	27.25	**10.71**	0.00	0.00	0.00	-	-	-	-	
2	Hauling	-	-	-	-	-	6.59	1.36	0.00	0.00	0.00	-	-	-	-	
2	Vendor	-	-	-	-	-	0.00	20.64	20.96	20.49	13.55	-	-	-	-	
2	Worker	-	-	-	-	-	0.23	42.49	40.69	42.16	29.65	-	-	-	-	
3	Onsite	-	-	-	-	-	-	-	-	-	-	**64.92**	58.07	58.07	59.65	37.29
3	Hauling	-	-	-	-	-	-	-	-	-	-	4.32	0.00	0.00	0.00	0.00
3	Vendor	-	-	-	-	-	-	-	-	-	-	1.09	6.99	6.89	6.81	3.29
3	Worker	-	-	-	-	-	-	-	-	-	-	1.31	7.07	6.60	6.68	3.84

[1]Bolded values used in HRA modeling.

Table 3 Vehicle PM2.5 Exhaust Emissions (pounds/year) by Year for Overlapping Scenario[1]

2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
4.22	**11.31**	7.81	**8.68**	8.39	**3.32**	3.18	3.02	2.16	**1.24**	**0.50**	0.48	0.31	0.03

[1]Bolded values used in HRA modeling.

Table 4 Vehicle PM2.5 Exhaust Emissions (pounds/year) by Year for Sequential Scenario[1]

2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
4.22	**11.31**	7.81	**8.21**	7.96	0.16	**3.10**	3.02	**3.05**	2.09	0.14	**0.48**	0.46	0.46	0.24

[1]Bolded values used in HRA modeling.

Dispersion Modeling

Atmospheric modeling was performed to analyze localized ambient air quality and health risk associated with the generation of $PM_{2.5}$ from construction equipment, construction-related on-road vehicles, and vehicles on the highway. Air dispersion modeling requires consideration and selection of the following parameters, which are described briefly below:

- Selection of the dispersion model
- Selection of appropriate dispersion coefficients based on land use
- Preparation of meteorological data
- Evaluation of potential terrain considerations
- Selection of receptor locations
- Identification of the source-specific release parameters, operational schedule, and averaging time periods

Model Selection. EPA's American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) model (Version 19191) was used to model diesel PM emissions from construction-related activities and highway emissions for the Construction and Highway HRA, respectively. AERMOD was applied with the regulatory default options and the rural modeling option (dispersion coefficients). The dispersion modeling to assess the exposure of the new receptors to the highway emissions are represented by a line source or series of volume sources. The dispersion modeling to assess the exposure of the existing off-site receptors and future on-site receptors to the construction-related emissions are represented by volume sources for the on-site equipment activity and as line sources for the on-road emissions. The resulting plotfiles for each volume source were imported to the HARP2 Air Dispersion and Risk Tool (Version 19121). Additional details are provided in Appendix A.

Meteorological Data. AERMOD requires a sequential hourly record of dispersion meteorology representative of the region within which the Project would be located. AERMOD was applied with 3 years (2010 to 2012) of hourly meteorological data consisting of surface observations from the San Diego International Airport meteorological station in San Diego (SDAPCD 2020), the nearest station to the Project site. A wind rose of the 3 years of data is shown in Figure 5. The wind rose indicates that the predominant wind direction is from the west-northwest to northwest.

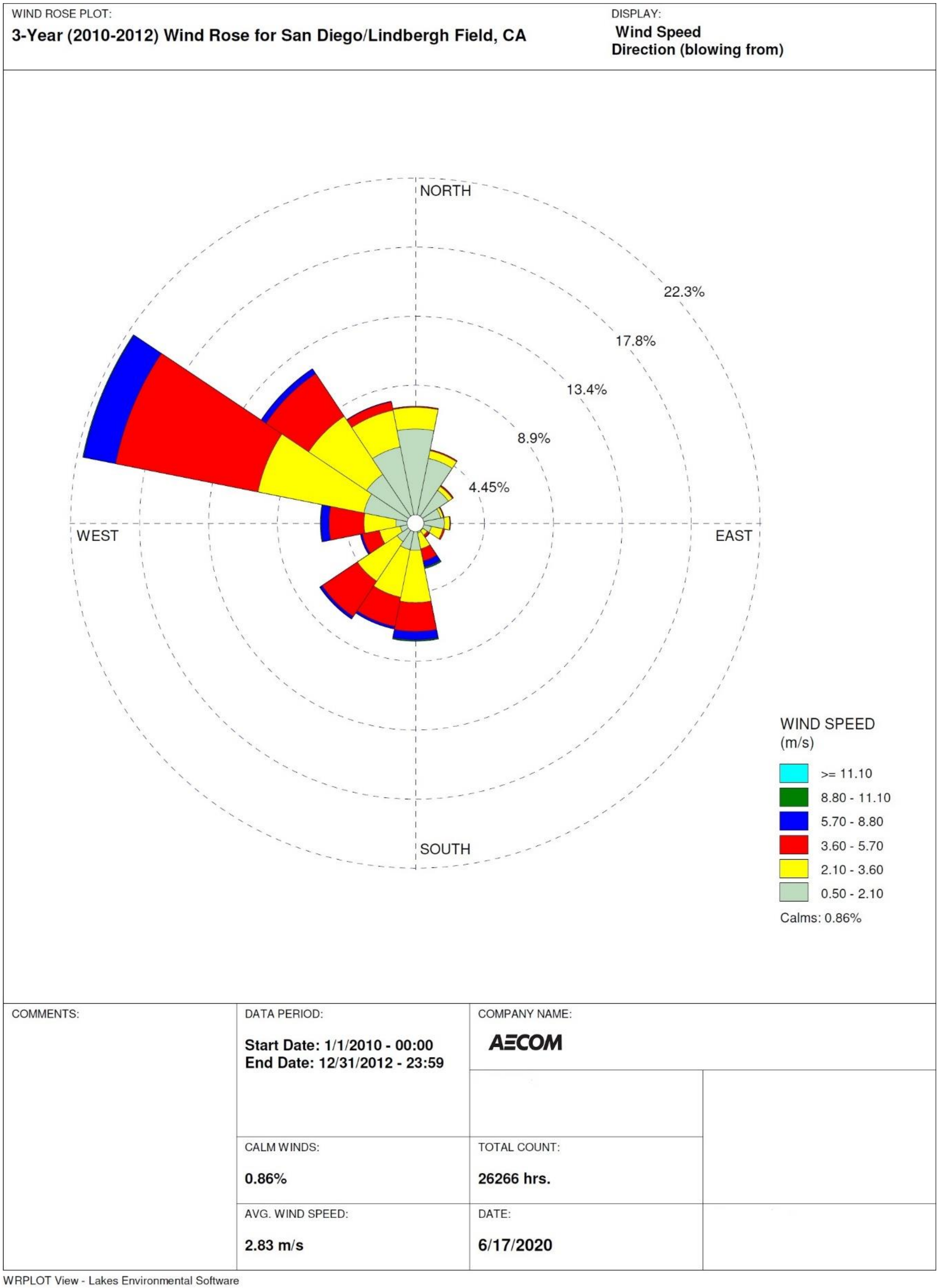


Figure 5 Wind Rose

Terrain and Receptor Data Processing. Terrain elevations were obtained from commercially available digital terrain elevations developed by the U.S. Geological Survey by using its National Elevation Dataset (NED). The NED data provide terrain elevations with 1-meter vertical resolution and 10-meter (1/3 arc-second) horizontal resolution based on a Universal Transverse Mercator (UTM) coordinate system. The U.S. Geological Survey specifies coordinates in North American Datum 83, UTM Zone 11. Lakes Environmental software was used to process the NED data and assign elevations to the receptor locations and sources. Electronic files containing these terrain elevations are included in the appendix. As shown in Figure 6, diesel PM concentrations were estimated for nearby receptors located within 1,000 feet of the Project, as well as the University of California San Diego Medical Center – Hillcrest, the Francis Parker Upper and Middle School and the San Diego County Office of Education/Classroom of the Future Foundation for the Construction HRA. For the nearby residential receptors, all were assumed to be two stories tall with the exception of the Town and Country buildings to the east of the Project site. The Town and Country Parcels 1 through 4 range in height from one to six floors. Receptors were placed at 6 feet (1.83 meters) above ground level on the first floor and increasing in height up to the sixth floor (56 feet).

The residential dwelling units that will be constructed during Phase 1 were assumed to be occupied beginning in 2026 and residential receptors were modeled to determine exposure from construction occurring in Phases 2 and 3. The residential dwelling units that will be constructed during Phase 2 were assumed to be occupied beginning in 2031 and residential receptors were modeled to determine exposure from construction occurring during Phase 3. These receptor locations were assumed to be six stories high. Model concentrations decrease with height above ground level such that any receptors above this height would be exposed to lower concentrations than the lower floors of each building.

As shown in Figure 7, diesel PM concentrations were estimated for grid receptors for the South District of the Project for the Highway HRA. Receptors were placed at 6 feet (1.83 meters) above ground level on the first floor and increasing in 10 foot increments up to 196 feet (59.74 meters). As explained previously, the exact uses, building layouts and features of the South District of the Project are not known at the time of this analysis; however zoning would allow for residential uses and construction up to 200 feet in height. All coordinates for sources and receptors were specified in North American Datum 83, UTM Zone 11.

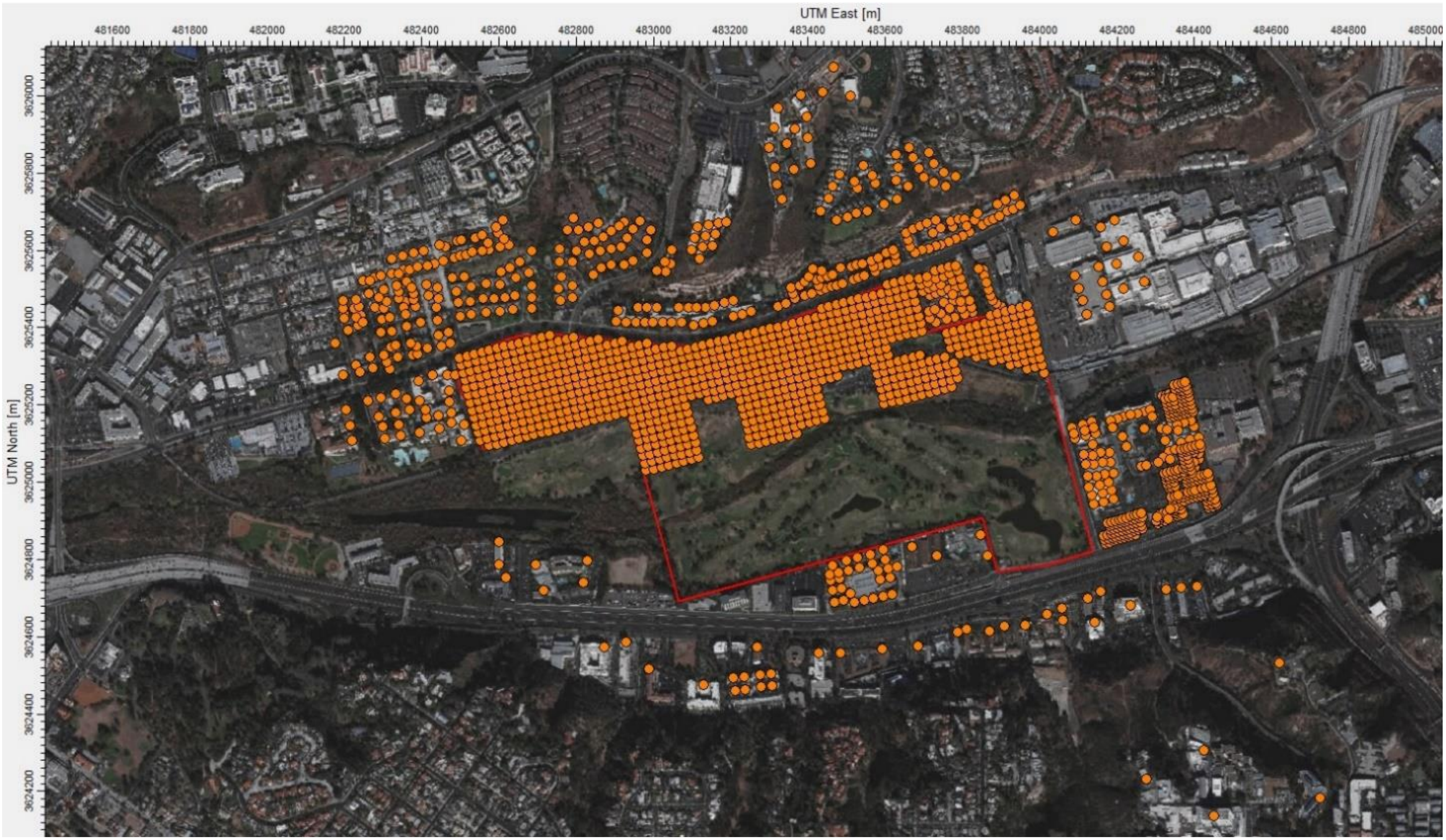


Figure 6 **Construction HRA Receptor Locations**

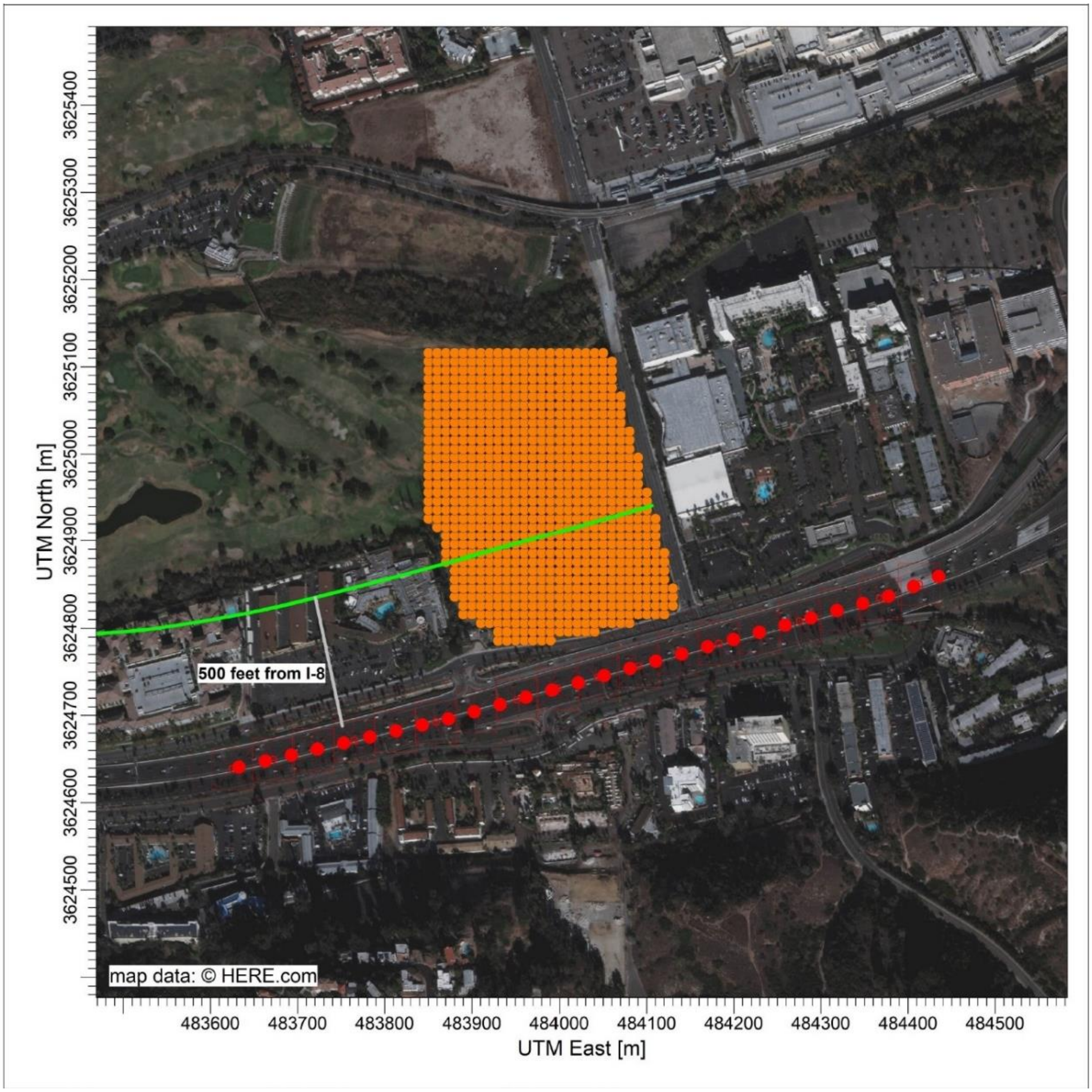


Figure 7 Highway HRA Sources and Receptor Grid

Schedule, Source Parameters, and Emissions Summary.

For the Construction HRA analyses, the operating schedule of the construction equipment used at the Project site was assumed to be 7 a.m. to 4 p.m., Monday through Friday. The volume-source parameters used in the air dispersion model to evaluate construction TAC emissions on nearby receptors are summarized in Table 5. The volume sources modeled in the three different construction phases are shown in Figure 8. As discussed previously, Phase 2 is divided into north and south regions due to the different types of construction that will take place in each area.

Table 5 Onsite Volume-Source Release Parameters for the Construction HRA

Phase	Source IDs	Release Height (m)[1]	Length of Side (m)	Initial Vertical Dimension (m)
Phase I	PH10001-PH10380	5.0	20	1.4
Phase II-N	PH2N0207-PH2N1417	5.0	20	1.4
Phase II-S	PH2S0001-PH2S0814	5.0	20	1.4
Phase III	PH30001-PH30170	5.0	20	1.4

Note:
1 Assumed to be the average equipment exhaust height.
Source: Data compiled by AECOM in 2020

On-road emissions from construction worker vehicles, haul trucks, material delivery trucks, and on-site work trucks traveling to and from the Project site were modeled as adjacent volume sources. The release height of these sources was set to 2 meters. The volume sources extend from the Project site to ¼ mile going west on Friars Road and to the on-ramp of I-8 at Hotel Circle North. During Phase 1 of construction, vehicle traffic is expected to occur on Friars Road and Fashion Valley Road to I-8. During Phases 2 and 3, vehicle traffic is expected to occur on Fashion Valley Road to I-8 as shown in Figure 9. Table 6 shows the release parameters modeled.

Table 6 Highway Volume-Source Release Parameters for the Construction HRA

Volume Source Names	Release Height (m)[1]	Initial Lateral Plume Size Sigma-Y (m)[2]
P3RD4526 – P3RD4573	2.00	4.65
P2RD1214 – P2RD1238	2.00	4.65
P1WR1239 – P1WR1473	2.00	4.65

Note:
1 Average of car exhaust release height of 3.3 feet, and truck exhaust of 10 feet.
2 Width of road divided by 2.15 per ISCST3 modeling guidance for volume sources.
Source: Data compiled by AECOM in 2020

Figure 8 Onsite Volume Sources Modeled for Each Construction Phase

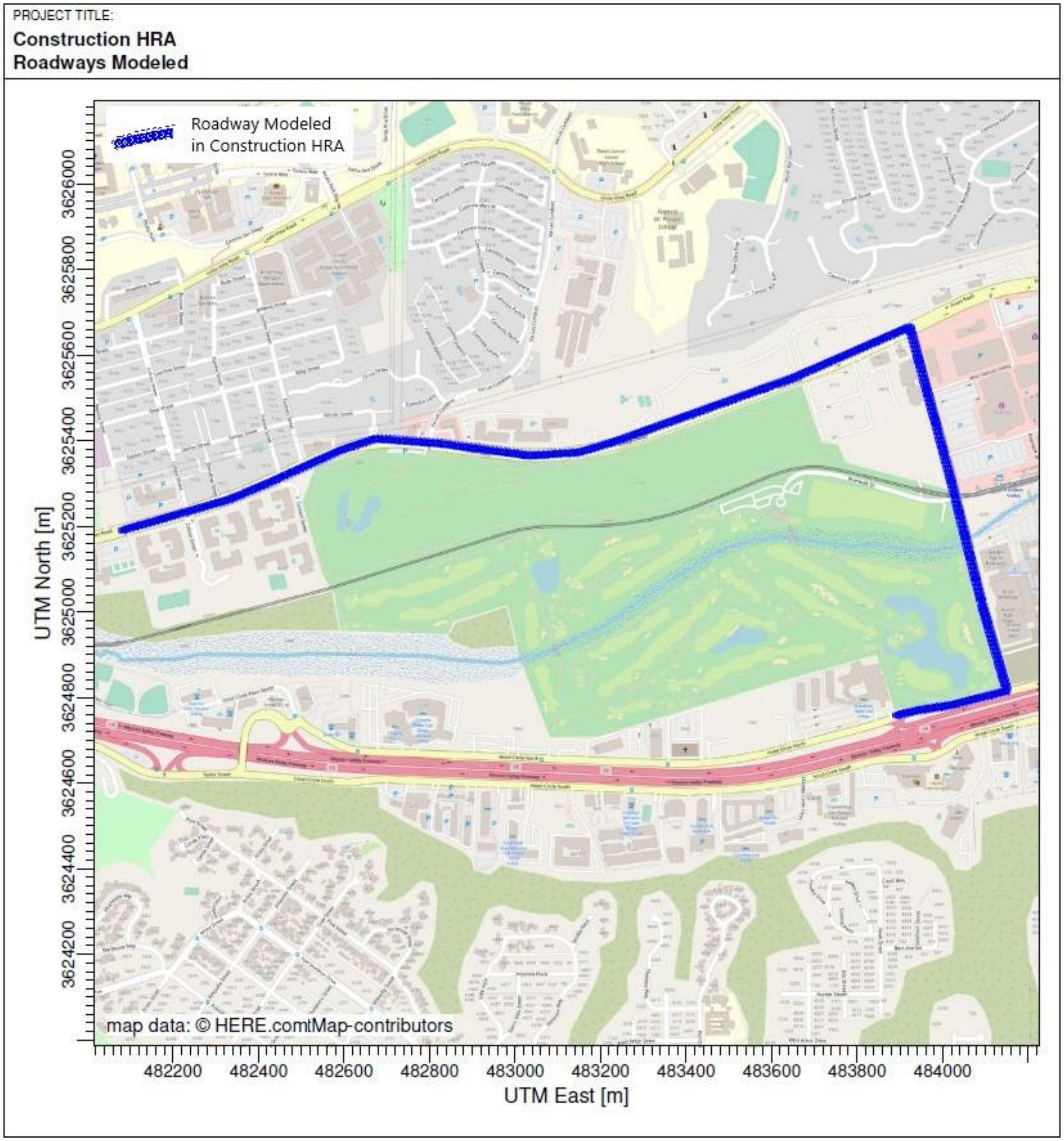


Figure 9 Construction HRA Roadway Sources

For the Highway HRA analysis, the volume source parameters used in the air dispersion model to represent the car/truck exhaust release height and plume size to evaluate TAC emissions from I-8 on the Project site receptors are summarized in Table 7. Figure 7 shows the volume sources used to represent the car/trucks on I-8.

Table 7 Volume-Source Release Parameters for the Highway HRA

Volume Source Names	Release Height (m)[1]	Initial Lateral Plume Size Sigma-Y (m)[2]
Cars (I8CA0612 – I8CA0629)	1.00	22.33
Trucks (I8TR0630 – I8TR0647)	3.05	22.33

Note:
1 Car exhaust release height of 3.3 feet, and truck exhaust of 10 feet.
2 Width of road (I-8 = 115 feet, SR-163 = 98 feet) divided by 2.15 per ISCST3 modeling guidance for volume sources.
Source: Data compiled by AECOM in 2020

Risk Characterization and Estimation. Risk characterization integrates exposure information provided by the dispersion modeling with potential health effects associated with specific TACs; this step provides quantitative estimates of potential health risks associated with TACs that the potential residents of the Project would be exposed. The line sources in Table 1 were each modeled with 1 gram per second (g/s) emission rates in AERMOD to calculate the unit concentration. The resulting plotfiles for each volume source were imported to the HARP2 Air Dispersion and Risk Tool (Version 19121). The HARP2 model is used to estimate carcinogenic and noncarcinogenic health risks from the Project. The HARP2 model uses the equations and algorithms contained in OEHHA's 2015 Risk Assessment Guidelines to calculate health risks based on input parameters such as emissions, "unit" ground-level concentrations, and toxicological data (OEHHA 2015).The emission rates were imported via CSV file and assigned to each volume source. The resulting plotfiles and additional details are provided in Appendix A.

The assessment was performed in accordance with the OEHHA's *Air Toxics Hot Spots Program Risk Assessment Guidelines: Guidance Manual for Preparation of Health Risk Assessments* (OEHHA 2015 Risk Assessment Guidelines) (OEHHA 2015), CAPCOA Guidance Document: Health Risk Assessments for Proposed Land Use Projects (CAPCOA 2009), and San Diego Air Pollution Control District (SDAPCD) Supplemental Guidelines for HRAs (SDAPCD 2019). Based on the guidance above, the options selected in HARP2 for the estimation of cancer risk for the Construction HRA are summarized in Table 8 and for the Highway HRA in Table 9.

Table 8 Summary of HARP2 Options for Construction HRA

Year	Phase	Offsite Receptors Scenario A		Offsite Receptors Scenario B		Offsite Receptors Scenario C		Phase 1 Receptors		Phase 2 Receptors	
		Start Age	**Exposure Duration (Years)**	**Start Age**	**Exposure Duration (Years)**	**Start Age**	**Exposure Duration (Years)**	**Start Age**	**Exposure Duration (Years)**	**Start Age**	**Exposure Duration (Years)**
		Overlapping Construction Scenario									
2021 - 2023	1	3rd Trimester	3								
2024 - 2025	1&2	3	2	3rd Trimester	2						
2026 - 2029	2	5	4	2	4			3rd Trimester	4		
2030	2&3	9	1	6	1	3rd Trimester	1	4	1		
2031 - 2034	3	10	4	7	4	1	4	5	4	3rd Trimester	4
Year	**Phase**	**Sequential Scenario**									
2021 - 2022	1	3rd Trimester	2								
2023 - 2025	1	2	3								
2026 - 2027	2	5	2	3rd Trimester	2			3rd Trimester	2		
2028 - 2030	2	7	3	2	3			2	3		
2031 - 2035	3	10	5	5	5	3rd Trimester	5	5	5	3rd Trimester	5

Table 9 Summary of HARP2 Options for Highway HRA

Option	Cancer - Resident
Exposure Duration	30
Start Age	3^{rd} Trimester
Method	Draft RMP using Derived Method
FAH	> 16 Years
8-hour Breathing Rates	N/A

The estimated excess lifetime cancer risks were compared to the thresholds for significance for TACs for a maximally exposed individual at the nearby and new residential receptors (MEIR).

3.3 Criteria Air Pollutants Health Risks Impact Analysis

As described in Appendix F of the EIR, construction-related activities would result in emissions of criteria air pollutants, but at levels that would not exceed the SDAPCD thresholds of significance. The thresholds of significance were based on the SDAPCD Air Quality Impact Assessment Trigger Levels, which were designed to identify those projects that would result in significant levels of air pollution and to assist the region in attaining the applicable state and federal ambient air quality standards (SDAPCD 2016). The ambient air quality standards were established using health-based criteria to protect the public with a margin of safety from adverse health impacts due to exposure to air pollution.

Further, the health effects of NO_X, which is a precursor to ozone, are discussed in the amicus brief filed by the South Coast Air Quality Management District (SCAQMD) in the *Sierra Club v. County of Fresno* (2014) 26 Cal.App.4^{th} 704. The brief states that it "takes a large amount of additional precursor emissions to cause a modeled increase in ambient ozone levels" (SCAQMD 2015b). In addition, the SCAQMD explained that it may be technically infeasible to accurately quantify ozone-related health impacts caused by NO_x or ROG emissions from relatively small projects, due to photochemistry and regional model limitations (SCAQMD 2015b). Furthermore, the SCAQMD brief stated that a project emitting only 10 tons per year of NO_x or VOC/[ROG] (the Project is estimated to generate a similar order of magnitude of emissions) is small enough that its regional impact on ambient ozone levels may not be detected in the regional air quality models used to determine ozone levels" (SCAQMD 2015b). Therefore, in this case, it would not be feasible to directly correlate project emissions of NO_x with specific health impacts from ozone. The SCAQMD explains that this is in part because ozone formation is not linearly related to emissions; ozone impacts vary depending on the location of the emissions, the location of other precursor emissions, meteorology, and seasonal impacts (SCAQMD 2015b). In addition, implementation of Specific Plan Reg-132, which requires the use of at a minimum Tier 3 engines with Tier 3 diesel particulate filters during construction, would minimize emissions of ROG and NOx. Therefore, it is not anticipated that Project construction would expose sensitive receptors to substantial concentrations of criteria air pollutants.

3.4 Construction and Highway HRA Analysis

Construction HRA Results

As discussed previously, the greatest potential for TAC emissions resulting from construction of the Project would originate from diesel PM emissions associated with heavy equipment operations. Construction of the Project would result in the generation of diesel PM from the use of off-road diesel construction equipment required for demolition, site preparation, building construction, architectural coatings, and paving activities. Other diesel PM emissions associated with material delivery trucks and construction worker vehicles would occur off-site.

The dose of TACs to which receptors are exposed is the primary factor used to determine health risk. Dose is a function of the concentration of a substance or substances in the environment and the extent of exposure a person has with the substance. Dose is positively correlated with time, meaning that a longer exposure period to a fixed amount of emissions results in a higher exposure level and higher health risks for the maximally exposed individual. Construction emissions would occur intermittently throughout the day, as construction equipment is required, rather than as a constant plume of emissions from the Project site. All construction emissions would cease following completion of the Project.

The estimated cancer risk was based on the maximum pounds per day of emissions from the construction phase times of the number of days the phase will last in each year to calculate the pounds per year of diesel PM concentration per year for each phase, inhalation potency factor, and default estimates of breathing rate, body weight, and exposure period. In addition to the potential cancer risk, diesel PM may result in chronic non-cancer health impacts. The exposure level is the concentration below which no adverse non-cancer health effects are anticipated.

Table 10 shows the maximum cancer risk and chronic hazard index (HI) for construction of the Project. The maximum cancer risk was determined to be 3.81 per 1 million for the Maximally Exposed Individual Resident (MEIR). The maximum chronic HI was determined to be less than 0.01 for the MEIR, as shown in Table 10. The values are below the thresholds of 10 per million and 1.0, respectively. The MEIR locations for each scenario are shown in Figure 10.

Table 10 Summary of Maximum Health Risk from Construction on Offsite, Phase 1 and Phase 2 Receptors

Risk	Offsite Receptors Scenario A	Offsite Receptors Scenario B	Offsite Receptors Scenario C	Phase 1 Receptors	Phase 2 Receptors
	Overlapping Construction Scenario				
Cancer (per million)	2.19	2.33	3.81	0.90	0.40
Chronic Hazard Index	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Risk	**Sequential Scenario**				
Cancer (per million)	1.98	2.11	2.82	1.13	0.48
Chronic Hazard Index	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

Highway HRA Results

As discussed in Section 1, ARB has developed the *Air Quality and Land Use Handbook* and *Technical Advisory* to provide guidance on land use compatibility with sources of TACs (ARB 2005, 2017). The recommendations in the *Air Quality and Land Use Handbook* relevant to the Project include avoid siting new sensitive land uses within 500 feet of a freeway, urban roads with 100,000 vehicles per day, or rural roads with 50,000 vehicles per day. As discussed in the *Technical Advisory*, the recommendation does not mean that nothing should be developed within the 500-feet distance and there are alternative strategies that can protect public health while not dictating development patterns, including siting non-sensitive uses and developments (e.g., commercial uses and offices) and encouraging design that promotes air flow and pollutant dispersion.

The South District of the Project site is located approximately 50 feet from I-8, a high-volume roadway (i.e., 100,000 vehicles per day within a 150-meter radius of the Project site) and has the potential to include sensitive uses, including residential buildings. The nearest residential receptor on the Project site could be located approximately 84 feet from I-8 as measured from the edge of the closest travel lane of I-8 to where the sidewalk meets the grass based on the existing configuration of Hotel Circle North. Therefore, the Project does not meet the recommendations in ARB's Air Quality and Land Use Handbook that suggest a 500-foot setback distance. Localized emissions from off-site mobile sources could adversely affect sensitive receptors that could be located in the South District of the Project. As the minimum distance between the Project boundary and I-8 is less than 500 feet, refined dispersion modeling was completed to accurately determine health risks from traffic emissions on the proposed sensitive receptors.

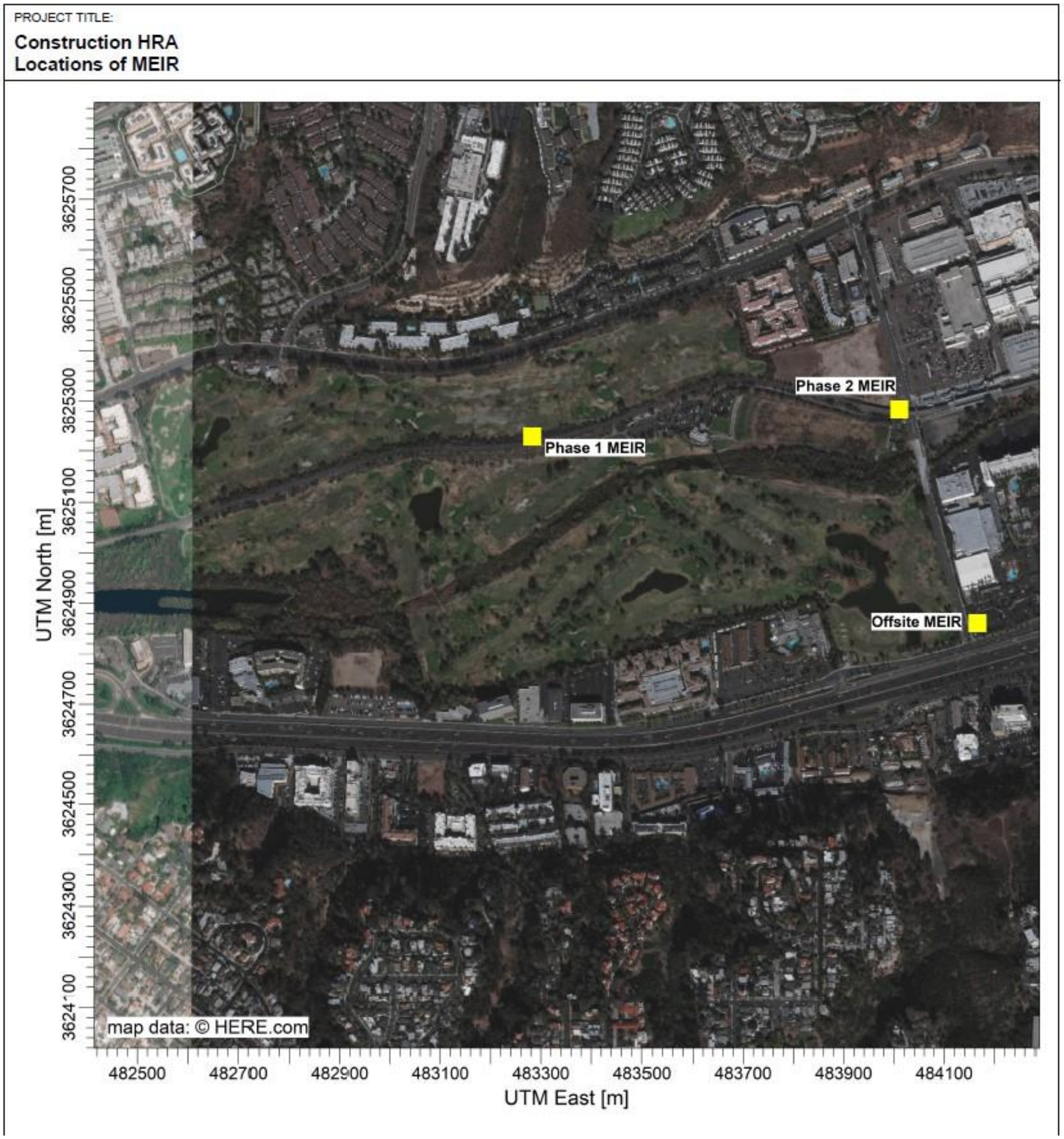


Figure 10 Construction HRA MEIR Locations

As presented in Table 11, the maximum 30-year cancer risk attributable to highway emissions was determined to be 42.1 in 1 million, and the maximum chronic HI was determined to be 0.011. Additional details are provided in Appendix A.

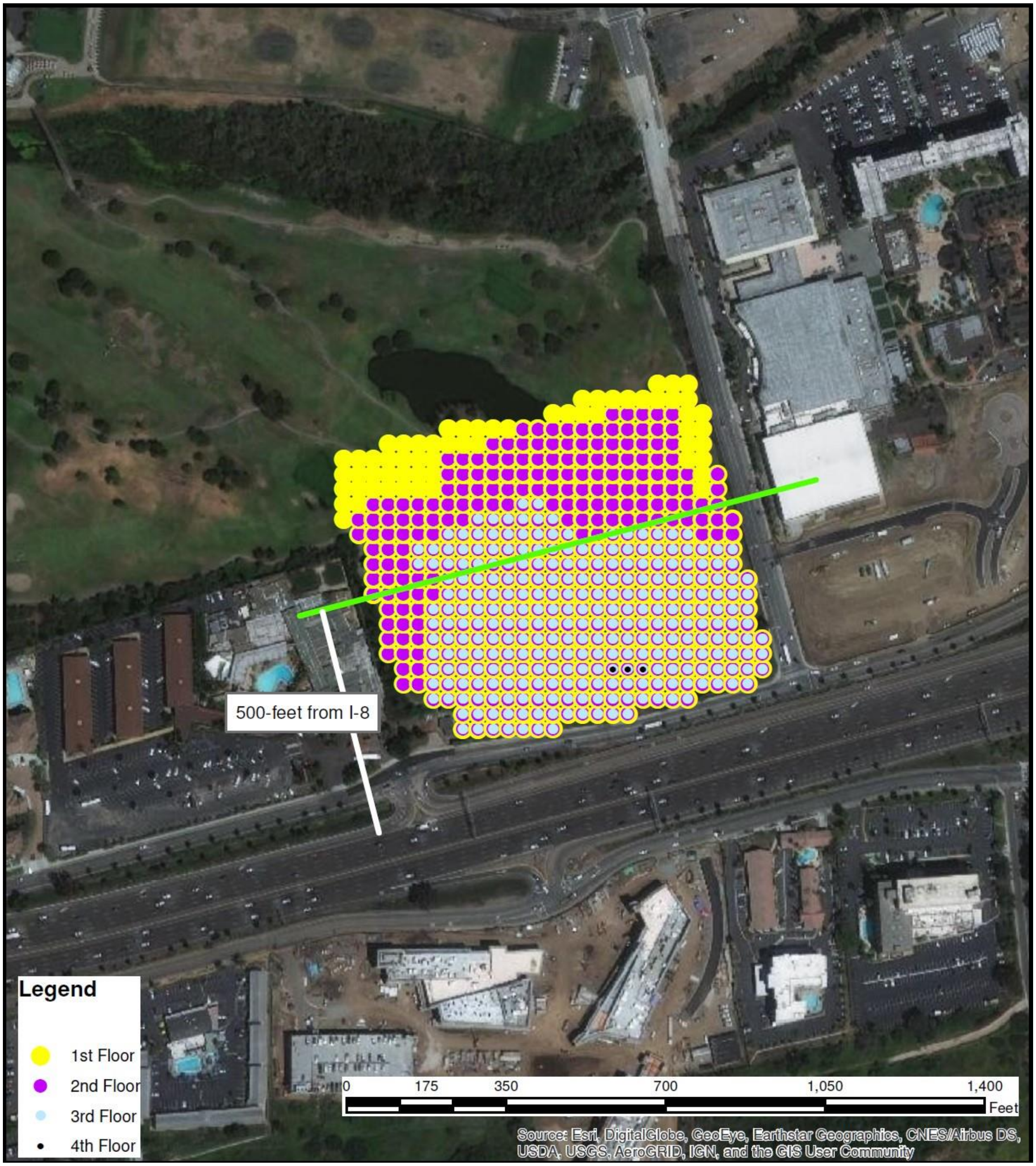
Table 11 Summary of Maximum Health Risk from I-8 on Project Site Receptors

Receptor Type	Unmitigated 30-year Maximum Cancer Risk (per million)	Maximum Chronic Hazard Index
MEIR[1]	42.1	0.011
CEQA Significance Threshold	10	1
Exceed Threshold?	**YES**	NO

[1] MEIR: Maximally exposed individual at a new residential receptor; 30-year exposure scenario for cancer risk.
Source: Data Compiled by AECOM in 2020

As shown in Table 3, the maximum cancer risk levels for the new residential receptors at the Project site would exceed 10 in 1 million due to the existing and future traffic volumes from I-8. Figure 11 shows the locations of the residential receptors that would exceed the significance threshold. Those locations include the first four floors of any residential buildings within 735 feet of I-8 on the Project site as measured from the edge of the closest travel lane of I-8 to the existing grass and sidewalk border of Hotel Circle North in its current configuration.

The Project could expose sensitive receptors that could be located in the South District to pollutant concentrations from highway emissions at levels that could result in a health risk. Implementation of Specific Plan Regs-196 through Reg-198, as outlined in the Specific Plan Regulations, would be required if residences occur within buildings constructed within 735 feet of I-8 assuming there are no non-residential buildings acting as a barrier between I-8 and the potential residences. If residences were constructed beyond this distance the cancer risk levels would be below the 10 in a million threshold and additional Specific Plan Regulations would not be required.



Source: Data Compiled by AECOM in 2020

Figure 11 Highway HRA Receptors Exceeding Significance Prior to Implementation of Specific Plan Regulations

To reduce health risks related to vehicle emissions from I-8, as presented in the Specific Plan, the Project will implement Specific Plan Reg-196 through Reg-198 relative to the South District.

Reg-196 The Project applicant shall be required to install air filtration devices rated minimum efficiency reporting value (MERV-13) or higher 13 in the intake of ventilation systems. Heating, air conditioning, and ventilation (HVAC) systems shall be installed with a fan unit designed to force air through the MERV filter. Prior to issuance of building permits, the Project applicant shall submit evidence to the City of San Diego to ensure compliance with this measure. To ensure long-term maintenance and replacement of the MERV filters in the individual residential units, the owner/property manager of residential units shall maintain and replace MERV filters in accordance with the manufacturer's recommendations.

Reg-197 If residential buildings are proposed adjacent to Hotel Circle North, a 10-foot landscape buffer shall be provided on the southern border of the property adjacent to Hotel Circle North per the draft ordinance amending Chapter 14, Article 3 of the San Diego Municipal Code (City of San Diego, 2020).

Reg-198 The Project applicant shall be required to design residential buildings so that the air intakes are on the northern and/or western sides of the buildings and away from Interstate 8, to the extent feasible.

Filter efficiency is rated using several scales, the most common of which is the MERV rating system. MERV-13 air filters are considered high efficiency filters able to remove from 75 to 90 percent of fine particulate matter, depending on the size of the particle, from indoor air (EPA 2013). Some studies estimate an average of 80 percent reduction for all particulates associated with a MERV-13 filter. However, as a conservative assumption, the mitigated emission concentrations were assumed to be a 75 percent reduction associated with implementation of Specific Plan Reg-132.

Both natural ventilation and system maintenance can reduce the effectiveness of any filtration device. People tend to open their windows or doors at least part of each day, and natural ventilation involves no filtration of incoming air (ARB 2012). Studies have also shown that homeowners are not provided with sufficient information regarding maintenance of their HVAC systems, or do not follow instructions for maintaining their filters (ARB 2012).

As required by Specific Plan Reg-197, planting trees can be an effective strategy for reducing exposure to air pollution. Particulate matter becomes trapped and filtered by the leaves, stems, and twigs of the trees, and trapped pollution particles are eventually washed to the ground by rainfall. Based on existing research, Specific Plan Reg-197 could result in a reduction in $PM_{2.5}$ concentration ranging from 0.5 to 5 percent (Nowak et. al, 2013). Potential reductions were not estimated for the remaining Specific Plan Regs to be conservative. Table 12 shows the maximum modeled cancer risk assuming 75 percent reduction due to MERV-13 filters (Reg-196) for the Project.

Table 12 Summary of Mitigated Health Risk from I-8 on Project Site Receptors

Receptor Type	Mitigated 30-year Maximum Cancer Risk (per million)	Maximum Chronic Hazard Index
MEIR[1]	10.53	0.003
CEQA Significance Threshold	10	1
Exceed Threshold?	YES	NO

[1] MEIR: Maximally exposed individual at a new residential receptor; 30-year exposure scenario for cancer risk.
Source: Data Compiled by AECOM in 2020

As shown in Table 12, the maximum cancer risk due to mitigated operational emissions was determined to be 10.53 in 1 million for the MEIR. Therefore, implementation of Specific Plan Reg-196 through Reg-198 would reduce significant health risks; however, six receptor locations adjacent to Hotel Circle North would still exceed the threshold of 10 in 1 million. To address this remaining health risks, implementation of Specific Plan Reg-199 is required.

Reg-199 The Project applicant shall design the Project such that residential units are set back a minimum of 100 feet from I-8 travel lanes (i.e., not including offramps). Specific Plan Reg-199 would require a setback of 100 feet from the closest travel lane of I-8 for residential construction. This may not be required pending the possible reconfiguration of Hotel Circle North and the required landscape setback in Reg-198. Reg-199 would eliminate the six receptor locations that currently exceed the 10 in 1 million threshold after taking Reg-196 through Reg-198 into account. With the implementation of Reg-196 through Reg-199, health risks to residences in building(s) proximate to I-8 would be less than significant. The Riverwalk Specific Plan identifies Reg-196 and Reg-197 as specifically to address locating potential residential development proximate to I-8. Reg-198 is recommended as an additional measure to further minimize exposure to health risks based on the refined analysis conducted and summarized in this report.

Section 4
Conclusions and Specific Plan Regulations

5.1 Conclusions

With the adherence to the Specific Plan Regulations contained herein, the Project would not expose sensitive receptors to substantial pollutant concentrations from construction equipment nor highway emissions that would result in a health risk. Accordingly, implementation of Specific Plan Regulations Reg-132, and Reg-196 through Reg-199 shall be required conditions of the Project.

5.2 Specific Plan Regulations

Reg-132 Construction contractors shall use equipment that meets, at a minimum, the ARB's and/or EPA's Tier 3 emissions standards with Tier 3 diesel particulate filters (DPF) for off-road diesel-powered construction equipment with more than 50 horsepower for all construction activities, unless it can be demonstrated to the City of San Diego that such equipment is not available. Documentation shall consist of signed written statements from at least two construction equipment rental firms. Any emissions control device used by the contractor shall achieve emissions reductions that are no less than what could be achieved by Tier 3 with Tier 3 DPF emissions standard for a similarly sized engine, as defined by ARB or EPA regulations. For any substitute emissions control device employed, the contractor shall provide documentation that the associated emissions reductions are no less than what could be achieved by Tier 3 engine with Tier 3 DPF emissions standards for a similarly sized engine.

Reg-196 The Project applicant shall be required to install air filtration devices rated minimum efficiency reporting value (MERV-13) or higher 13 in the intake of ventilation systems. Heating, air conditioning, and ventilation (HVAC) systems shall be installed with a fan unit designed to force air through the MERV filter. Prior to issuance of building permits, the Project applicant shall submit evidence to the City of San Diego to ensure compliance with this measure. To ensure long-term maintenance and replacement of the MERV filters in the individual residential units, the owner/property manager of residential units shall maintain and replace MERV filters in accordance with the manufacturer's recommendations.

Reg-197 The Project applicant shall be required to design residential buildings so that the air intakes are on the northern and/or western sides of the buildings and away from Interstate 8, to the extent feasible.

Reg-198 If residential buildings are proposed adjacent to Hotel Circle North, a 10-foot landscape buffer shall be provided on the southern border of the property adjacent to Hotel Circle North.

Reg-199 The Project applicant shall design the Project such that residential units are set back a minimum of 100 feet from I-8 travel lanes (i.e., not including offramps).

Section 5
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Appendix A

Health Risk Assessment Modeling Files

Modeling Archive for the Riverwalk HRA Modeling
Provided as ZIP File
August 2020

This document summarizes the modeling archive content of the AERMOD, HARP2, and other model input data folders as described below.

HIGHWAY HRA

AERMOD – Contains AERMOD input (.inp) and output (.out) files as well as plot files (plt) produced by AERMOD that contain the concentrations at each receptor. AERMOD was run for two road sources – cars and trucks – for 1-hour and PERIOD averaging periods. These plot files were used to run HARP2. The modeling was conducted using Version 19191, the current EPA-approved version of the AERMOD model.

AERMAP – Contains AERMAP input and output files as well as zipped NED file to calculate base elevation information for sources and receptors.

Emissions – Contains spreadsheet with emissions for HARP.

HARP2 – Contains the HARP input and output files.

CONSTRUCTION HRA

AERMOD – Contains AERMOD input (.inp) and output (.out) files as well as plot files (plt) produced by AERMOD that contain the concentrations at each receptor. AERMOD was run for each phase of construction (both on-site sources and roadways within ¼ mile) for off-site, Phase I and Phase II receptors – for 1-hour and PERIOD averaging periods. These plot files were used to run HARP2. The modeling was conducted using Version 19191, the current EPA-approved version of the AERMOD model.

AERMAP – Contains AERMAP input and output files as well as zipped NED file to calculate base elevation information for sources and receptors.

Emissions – Contains spreadsheet with emissions for HARP for each group of years modeled in the overlapping and sequential scenarios.

HARP2 – Contains the HARP input and output files for the overlapping and sequential scenarios for each group of years and receptors modeled. The emissions spreadsheets highlight which year of emissions were used in each group.

Met_Data – Contains three full years (2010-2012) of the San Diego/Lindbergh Field, CA surface station and the Miramar Naval Air Station, CA upper air station for use in AERMOD. Meteorological data was processed by SDAPCD using AERMET version 19191, the current EPA-approved version of the AERMOD model.