ATTACHMENT 13

HEALTH RISK ASSESSMENT FOR ON-SITE WASTEWATER TREATMENT PLANT

RAMBOLL

ENVIRONMENT
& HEALTH

MEMO

Date: **July 9, 2020**

To: **Bibiana Alvarez, Project Manager, Analytical Environmental Services**

From: **Shari Beth Libicki, PhD**

Taylor Vencill, MS, PE

Subject: **HEALTH RISK ASSESSMENT FOR PROPOSED WASTEWATER TREATMENT PLANT OPERATIONS AT POINT MOLATE, RICHMOND, CALIFORNIA**

Ramboll
201 California Street
Suite 201
San Francisco, CA 94111
USA

T +1 415 796 1950
F +1 415 398 5812
www.ramboll.com

Ramboll US Corporation (Ramboll) conducted a Health Risk Assessment (HRA) for the proposed onsite wastewater treatment plant (WWTP) operations as part of the Project at Point Molate in Richmond, California ("the Project"). This memo details the methods and assumptions used in the HRA, including emissions estimation and dispersion modelling.

Ramboll understands that the Project plan includes a potential on-site wastewater treatment plant (WWTP). Under this scenario, a stand-alone WWTP will be installed on the Project site, along with one (1) emergency generator servicing operations at the on-site facility. Two (2) additional emergency generators will be installed in order to service two lift stations which will connect the WWTP to piping infrastructure across the Project site. Ramboll also understands that if the Project does not proceed with implementation of on-site wastewater treatment, emergency generators would still be required for transport of wastewater to the local wastewater treatment plant; however, this scenario is evaluated under a separate HRA specific to Project emergency generator operations.

THRESHOLDS OF SIGNIFICANCE

The City of Richmond is the lead agency responsible for Project approval. Per City of Richmond requirements, Ramboll evaluated the Project in accordance with the current Bay Area Air Quality Management District (BAAQMD) California Environmental Quality Act (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 wastewater treatment plant HRA, the BAAQMD thresholds of significance are as follows:

- Increased cancer risk of >10.0 in a million

[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

- Increased non-cancer risk of > 1.0 HI (chronic or acute)
- Ambient $PM_{2.5}$ increase: > 0.3 µg/m^3 annual average

Ramboll evaluated each of these thresholds for on-site sensitive receptors, assuming all eight parcels may include residential land uses, as well as the nearest off-site residential areas. Within certain multi-story buildings near proposed emission sources, elevated residential receptors were modeled at 3 meter vertical intervals up to the projected height of each building in order to represent potential residents living on each building floor. The model receptor grid is shown in **Figure 1** and specifies the receptors modeled at ground-level and at elevated heights. Other than receptors within the nearest off-site residential area, no additional sensitive receptors were identified in the Project vicinity (see **Appendix A**).

WASTEWATER TREATMENT PLANT OPERATIONAL EMISSIONS

The following sections describe the input data and methodologies used in the wastewater treatment plant HRA. Detailed information for each section can be found in the referenced tables and appendices.

Toxic Air Contaminant (TAC) Emissions

The TAC emissions associated with the operation of the wastewater treatment plant and the associated wastewater treatment plant lift pump generators were calculated with the following assumptions:

1. Process-related Toxic Air Contaminants (TACs): TAC emissions were used to evaluate the cancer risk, non-cancer chronic Hazard Index (HI) and acute HI from wastewater treatment processes. In this analysis, process VOCs were assumed to include a variety of speciated compounds associated with treatment of wastewater from residential and commercial uses. Speciated TACs emitted as process VOCs were determined using the California Air Toxics Emission Factors (CATEF) Inventory for wastewater streams, excluding any TACs that were not included in permitted emissions for the nearby Richmond municipal wastewater treatment plant. Emission factors are multiplied by the anticipated maximum daily and annual design throughputs in order to represent short-term (hourly) and long-term (annual) TAC emission rates, respectively. Per this methodology, all VOCs are conservatively assumed to speciate into TACs. Any compounds permitted by the BAAQMD at the Richmond municipal WWTP which may be emitted from wastewater per CATEF but do not have toxicity per OEHHA are excluded from the analysis in order to conservatively assign greater emissions to toxic compounds.
2. Diesel Particulate Matter (DPM): DPM emissions were used to evaluate the cancer risk and non-cancer chronic HI from emergency generator operations at the WWTP facility and at lift stations along the wastewater collection pipeline. In this analysis, total Particulate Matter (PM) exhaust emissions were conservatively assumed as DPM. Diesel exhaust, a complex mixture that includes hundreds of individual constituents, is identified by the State of California as a known carcinogen (California Environmental Protection Agency [Cal/EPA] 1998)[2]. Under California regulatory guidelines, DPM is used as a surrogate measure of exposure for the mixture of chemicals that make up diesel exhaust as a whole. Cal/EPA and other proponents of using the surrogate approach to quantifying cancer risks associated with the diesel mixture indicate that this method is

[2] California Environmental Protection Agency (Cal/EPA), Office of Environmental Health Hazard Assessment (OEHHA). 1998. Findings of the Scientific Review Panel on The Report on Diesel Exhaust, as adopted at the Panel's April 22, 1998, meeting.

preferable to use of a component-based approach. A component-based approach involves estimating risks for each of the individual components of a mixture. Critics of the component-based approach believe it will underestimate the risks associated with diesel as a whole mixture because the identity of all chemicals in the mixture may not be known and/or exposure and health effects information for all chemicals identified within the mixture may not be available. Furthermore, Cal/EPA has concluded that "potential cancer risk from inhalation exposure to whole diesel exhaust will outweigh the multi-pathway cancer risk from the speciated components" (OEHHA 2003). The DPM analyses for cancer and chronic hazards will be based on the surrogate approach, as recommended by Cal/EPA. Emission factors for each of the generators are assumed based on California Air Resources Board (CARB) Off Road Compression - Ignition Diesel Engine Standards[3]. Proposed lift pump generator engines were assumed to be certified Tier 4.

3. $PM_{2.5}$: Exhaust Particulate Matter less than 2.5 microns in diameter ($PM_{2.5}$) emissions were used to evaluate the $PM_{2.5}$ concentration due to emergency generator operation. $PM_{2.5}$ emissions were conservatively assumed to be equal to total PM emissions, although some particles categorized as total PM are, in actuality, larger than $PM_{2.5}$.

Modeled emissions from wastewater treatment plant process TACs are presented in **Table 1** and modeled emissions from emergency generator operations are presented in **Table 2.** Total PM from emergency generator operations is displayed; $PM_{2.5}$ and DPM emissions are conservatively assumed to be equivalent to these values.

Wastewater Treatment Plant Health Risk Assessment

Ramboll analyzed Project wastewater treatment plant-related risks by estimating ambient air concentrations of TACs, DPM and $PM_{2.5}$. To estimate air concentrations of TACs, DPM and $PM_{2.5}$, Ramboll used AERMOD, a steady-state Gaussian plume model developed by USEPA for regulatory applications. For each receptor location, AERMOD generates air concentrations that result from emissions from multiple sources. If unit emissions (i.e., 1 g/s) are modeled, the resultant value for each receptor location is called the air dispersion factor. AERMOD requires emission source locations and release parameters, receptor locations, and processed meteorological data. Input meteorological data sources include surface data from the Chevron Long Wharf meteorological observation station, upper air data from Oakland International Airports, and land cover data from the 1992 National Land Cover Data Set of the United states Geological Survey. Ramboll processed five years (2013, 2014, 2015, 2017, and 2018) of complete meteorological data from nearby stations with the USEPA's meteorological data preprocessor, AERMET. A wind rose for this meteorological data set is shown in **Figure 2**.

Model Source Locations

Process TAC emissions from operations at the WWTP facility are represented as an area source and conservatively assumed to occur uniformly across the WWTP building area south of planning parcel A. The emergency generator located at the WWTP facility is assumed to be placed approximately adjacent the proposed WWTP Operator's Building on the site. These sources are shown in **Figure 3**, along with the two additional emergency generators along the wastewater collection pipeline.

Model Source Parameters

[3] Cal/EPA. 2015. Air Toxics Hot Spots Program. Risk Assessment Guidelines. Guidance Manual for Preparation of Health Risk Assessments. Office of Environmental Health Hazard Assessment (OEHHA). February. Available online at: http://oehha.ca.gov/air/hot_spots/hotspots2015.html.

Process TAC emissions for WWTP operations were modeled as an area source, assuming dimensions equal to the proposed size of the above-ground facility. Area source emissions are assumed to be released at ground level. Model source parameters are shown in **Table 3**.

Emissions from emergency generators were modeled as point sources, assuming up to 50 hours of operation annually per generator for mandatory testing and maintenance. Per BAAQMD guidance, health risks due to emergency operation were not modeled.[4] Model emission rates assume emissions are spread across 8,760 hours per year, assuming generators may operate at any hour of the day. Generator release parameters (including stack height, diameter, exit temperature, and exit velocity) are determined based on default parameters from BAAQMD given in the San Francisco Citywide Health Risk Assessment: Technical Support Documentation[5]. Source parameters for all emergency generators are shown in **Table 3**, and AERMOD input files are provided electronically as **Appendix B**. As discussed above, emissions were modeled using the unit rate emission factor method, such that the model estimates dispersion factors are based on an emission rate of 1 g/s and the dispersion factors have units of [µg/m3]/[g/s]. Estimated emissions were multiplied by the dispersion factors to obtain concentrations.

Building Downwash

The AERMOD model incorporates Plume Rise Modeling Enhancements (PRIME) to account for downwash. The direction-specific building downwash dimensions used as inputs were determined by the latest version (04274) of the Building Profile Input Program, PRIME (BPIP PRIME). BPIP PRIME uses building downwash algorithms incorporated into AERMOD to account for the plume dispersion effects of the aerodynamic wakes and eddies produced by buildings and structures.

On-site buildings nearby modeled generator sources were evaluated for downwash effects on each modeled point source. Five onsite buildings were included in the building downwash evaluation, including the WWTP building as well as residential and commercial structures near the lift pump stations. Modeled buildings are shown in **Figure 4** and BPIP PRIME output is included electronically with AERMOD modeling files in **Appendix B**.

Exposure Parameters and Cancer Risk Calculation

This analysis followed the recommended methodology from the 2015 Office of Environmental Health Hazard Assessment (OEHHA) Hot Spots Guidance as adopted in the BAAQMD HRA Guidelines[6]. Ramboll conservatively evaluated Project impacts due to WWTP operations and associated emergency generator emissions using default exposure assumptions for a resident child from OEHHA. The resident child scenario assumes a much higher daily breathing rate and age-sensitivity factor (ASF)[7] than other sensitive receptor populations and therefore is the most conservative scenario to evaluate for this analysis. The exposure parameters used to estimate excess lifetime cancer risks for a resident child are presented in **Table 4**.

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[4] BAAQMD. 2019. Policy: Calculating Potential to Emit for Emergency Backup Power Generators. Available at: https://www.baaqmd.gov/~/media/files/engineering/policy_and_procedures/banking-and-offsets/calculating-pte-for-emergency-generators-06032019-pdf.pdf?la=en

[5] San Francisco Department of Public Health. 2020. San Francisco Citywide Health Risk Assessment: Technical Support Documentation (Table 7). February 2020. Available online at: https://www.sfdph.org/dph/files/EHSdocs/AirQuality/Air_Pollutant_Exposure_Zone_Technical_Documentation_2020.pdf

[6] BAAQMD. 2016. Proposed Health Risk Assessment Guidelines. Air Toxics NSR program. January. Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/rules-and-regs/workshops/2016/reg-2-5/hra-guidelines_clean_jan_2016-pdf.pdf?la=en

[7] Ibid.

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:

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

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)
CF	=	Conversion Factor, 0.001 (m^3/L)
ASF	=	Age Sensitivity Factor (unitless)
AT	=	Averaging Time (days)

The chemical intake or dose is estimated by multiplying the inhalation intake factor, IF_{inh}, by the chemical concentration in air. When coupled with the chemical concentration, this calculation is mathematically equivalent to the dose algorithm given in the OEHHA Hot Spots guidance[8].

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. Both acute and chronic non-cancer endpoints were evaluated. 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, chronic hazard HI and acute hazard HI calculations utilize toxicity factors for the emitted compounds identified in Tables 1 and 2. This HRA considers risks from both TACs emitted from wastewater treatment processing and DPM emitted from emergency generator testing. Toxicity values for all emitted compounds[9] are as presented in **Table 5**.

Cancer risk, chronic HI and acute HI were calculated from ambient annual concentrations using intake factors, cancer potency factors, chronic reference exposure levels and acute reference exposure levels calculated consistent with the 2015 OEHHA Hot Spots Guidance[10]. DPM does not have an associated acute HI reference exposure level, so acute HI impacts were not evaluated from emergency generator operations.

Results from the HRA are shown in **Table 6**. The maximum cancer risk from the operation of the WWTP and associated emergency generators is calculated to be 1.1 in a million. This would also result in a maximum chronic HI of 0.0039, a maximum acute HI of 0.028 and maximum $PM_{2.5}$ concentration of 0.00081 micrograms per cubic meter (µg/m^3). Cancer risks for each modeled receptor are shown in **Figure 5**.

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[8] Cal/EPA. 2015. The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments. Office of Environmental Health Hazard Assessment. February. Available at: https://oehha.ca.gov/media/downloads/crnr/2015guidancemanual.pdf

[9] Ibid.

[10] Ibid.

Impacts presented here represent a portion of overall project operational impacts. For a complete evaluation of Project operational impacts, please refer to the Project Operational Health Risk Assessment Memo.

Attachments:

Tables

Figures

Appendix A: Sensitive Receptor Search Results

Appendix B: AERMOD Input Files (provided Electronically)

TABLES

Table 1
WWTP TAC Emissions
Point Molate
Richmond, California

Average DailyThroughput (MMgd)	0.30
Maximum Daily Throughput (MMgd)	1.0
VOC Emissions (lb/yr)[1]	89

Pollutant[2]	**CAS**	**CATEF Mean Composition[3,4,5]**	**VOC Composition**	**Emissions**				
				Annual[6]			**Maximum Hourly[7]**	
		(ug/l)	**(%)**	**(lb/yr)**	**(tpy)**	**(g/s)**	**(lb/hr)**	**(g/s)**
1,1,1-Trichloroethane	71-55-6	144	5.3	4.72	2.4E-03	6.8E-05	1.8E-03	2.3E-04
Ammonia	7664-41-7	2130	79.0	70.0	0.0350	1.0E-03	2.7E-02	3.4E-03
Benzene	71-43-2	39	1.4	1.28	6.4E-04	1.8E-05	4.9E-04	6.1E-05
Chloroform	67-66-3	39	1.4	1.28	6.4E-04	1.8E-05	4.9E-04	6.2E-05
p-Dichlorobenzene	106-46-7	34	1.3	1.11	5.5E-04	1.6E-05	4.2E-04	5.3E-05
Formaldehyde	50-00-0	6	0.2	0.20	9.8E-05	2.8E-06	7.5E-05	9.4E-06
Isomers of xylene	1330-20-7	39	1.4	1.28	6.4E-04	1.8E-05	4.9E-04	6.1E-05
Methylene Chloride	75-09-2	69	2.6	2.27	1.1E-03	3.3E-05	8.6E-04	1.1E-04
Perchloroethylene	127-18-4	40	1.5	1.30	6.5E-04	1.9E-05	5.0E-04	6.3E-05
Toluene	108-88-3	116	4.3	3.81	1.9E-03	5.5E-05	1.4E-03	1.8E-04
Trichloroethylene	79-01-6	41	1.5	1.35	6.8E-04	1.9E-05	5.1E-04	6.5E-05

Notes

1. Total WWTP plant VOC emissions are calculated based on emission factors for each plant process (as per methodology recommended by the Mojave Desert Air Quality Management District) and the WWTP description provided by the Project Sponsor. Details of these calculations can be found in Table A8 of the full emissions summary report.
2. Only toxic VOCs that are permitted from the City of Richmond municipal wastewater treatment plant are analyzed here. This plant is assumed to provide a reasonable proxy for likely emissions from the Point Molate WWTP.
3. Wastewater composition data is based on the California Air Toxics Emission Factors database mean factors for wastewater streams. Hydrogen sulfide is included as a VOC in the CATEF registry, though hydrogen sulfide doesn't have associated health risks and is not a VOC. To be conservative, hydrogen sulfide is not included in the emissions, which creates larger VOC composition percentages for other pollutants with health risks.
4. The CATEF Mean Composition value is retrieved form the "Composition" category of wastewater emissions when available. Ammonia and formaldehyde do not have a mean composition value associated with the "Composition" category, although there are several other categories of wastewater emissions associated with more specific steps in the treatment process. For the pollutants which do not have CATEF values associated with composition wastewater, the mean compositions were retrieved from the "Aeration Basin" category as this category had the largest associated emissions of these pollutants of all available CATEF wastewater categories.
5. VOC Composition data are calculated assuming all VOC emissions are speciated into the toxic compounds listed here; total VOC emissions are multiplied by the ratio of each toxic compound's concentration to the sum of all toxic concentrations listed.
6. Annual emissions are based on the average daily flow rate and assume 365 days per year of operation.
7. Maximum hourly emissions are based on the maximum daily design throughput and assume 24 hours per day of flow.

Abbreviations

ug - microgram
BAAQMD - Bay Area Air Quality Management District
CAS - Chemical Abstracts Service identifier
CATEF - California Air Toxics Emission Factors
EF - emission factor
g - gram
l - liters
lb - pound
MMgd - million gallons per day
s - second
TAC - toxic air contaminant
tpy - tons per year
VOC - volatile organic compound
WWTP - wastewater treatment plant

References

California Air Toxics Emission Factor Database. Online at: https://www.arb.ca.gov/app/emsinv/catef_form.html

Table 2
WWTP Emergency Generator Emissions
Point Molate
Richmond, CA

Source	Engine Tier	Size[1,2]		Annual Operation Hours	Pollutant	Emission Factor[1]	Emissions[2]	
		(kW)	(hp)			(g/hp-hr)	(tpy)	(g/s)
Emergency Generator - Lift Pump 1	Tier 4 Final	50	67	50	DPM	0.02	7.4E-05	2.1E-06
Emergency Generator - Lift Pump 2		50	67	50		0.02	7.4E-05	2.1E-06
Emergency Generator - WWTP Facility		500	671	50		0.01	3.7E-04	1.1E-05

Notes:

1. Diesel engine emission factors are based on CARB standards for diesel generator engines. Emission factors for DPM are assumed to be equal to total Particulate Matter.
2. Modeled emission rates assume emissions are distributed across 8760 hours/year, assuming generators may operate at any hour of the day.

Abbreviations:

DPM - Diesel Particulate Matter
g/s - grams per second
hp - horsepower
hr - hour
kW - kilowatt
tpy - tons per year

References:

California Air Resources Board Non-road Diesel Engine Certification Tier Chart. Available online at: https://ww2.arb.ca.gov/resources/documents/non-road-diesel-engine-certification-tier-chart

Table 3
WWTP Model Source Parameters
Point Molate
Richmond, CA

Area Source Parameters[1]

Source	Area (m^2)	Release Height	Sigma-z (m)
WWTP Process VOCs	6372	0	0

Point Source Parameters[2,3]

Source	Stack Height (m)	Temp (K)	Release Velocity (m/s)	Diameter (m)
Lift Pump 1	3.66	739.8	45.3	0.18288
Lift Pump 2	3.66	739.8	45.3	0.18288
WWTP Emergency Gen	2.53	823.2	126	0.127

Notes:

1. While emissions are released at various points in the wastewater treatment process, modeled emissions are approximated as a single area source covering the entire treatment plant area. Emissions are conservatively assumed to be released at ground level.
2. Release parameters for lift station generators are assumed based on default parameters from BAAQMD given in the San Francisco Citywide Health Risk Assessment: Technical Support Documentation.
3. The WWTP emergency generator modeling parameters are based on specifications for the planned generator provided by the Project Sponsor.

Abbreviations:

K - Kelvin

m - meters

m/s - meters per second

VOC - Volatile Organic Compound

WWTP - Waste Water Treatment Plant

Table 4
Cancer Risk Exposure Parameters
Point Molate
Richmond, California

Receptor Type	Receptor Age Group	Exposure Parameters									
		Daily Breathing Rate (DBR)[1] (L/kg-day)	Exposure Duration (ED)[2] (years)	Fraction of Time at Home (FAH)[3] (unitless)	Exposure Frequency (EF)[4] (days/year)	Conversion Factor (CF) (m^3/L)	Averaging Time (AT) (days)	Modeling Adjustment Factor (MAF)[5] (unitless)	Intake Factor, Inhalation (IF_{inh}) (m^3/kg-day)	Age Sensitivity Factor (ASF)	Cumulative Intake Factor, Inhalation (IFinh) (m^3/kg-day)
Resident (Onsite & Offsite)	3rd Trimester	361	0.25	1	350	0.001	25,550	1	0.0012	10	0.68
	Age 0-<2 Years	1,090	2	1	350	0.001	25,550	1	0.030	10	
	Age 2-<16 Years	572	14	1	350	0.001	25,550	1	0.11	3	
	Age 16-30 Years	261	14	0.73	350	0.001	25,550	1	0.037	1	

Notes:

1. Daily breathing rates for residents reflect breathing rates from Cal/EPA 2015 as follows: 95th percentile for 3rd trimester and age 0-<2 years; 80th percentile for ages 2-<9 years, 2-<16 years, and 16-30 years.
2. The total exposure duration for operation reflects the default residential exposure duration from Cal/EPA 2015.
3. Fraction of time at home for residential receptors was conservatively assumed to be 1 for age groups younger than 16 years old (100%). The FAH of 0.73 for age group 16 and above is the default value from Cal/EPA 2015.
4. Exposure frequency is the default exposure frequency for residents from Cal/EPA 2015.

Calculation:

Resident:

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

CF = 0.001 (m^3/L)

Unit Risk Factor = Cumulative Ifinh x Inhalation CPF/1000

Abbreviations:

Cal/EPA - California Environmental Protection Agency

DPM - Diesel Particulate Matter

L - liter

kg - kilogram

m^3 - cubic meter

Reference:

Cal/EPA. 2015. Air Toxics Hot Spots Program. Risk Assessment Guidelines. Guidance Manual for Preparation of Health Risk Assessments. Office of Environmental Health Hazard Assessment (OEHHA). February. Available online at: http://oehha.ca.gov/air/hot_spots/hotspots2015.html.

Table 5
WWTP Toxicity Parameters
Point Molate
Richmond, CA

Chemical	CAS No.	Cancer Potency Factor	Chronic REL	Acute REL
		$[mg/kg\text{-}day]^{-1}$	$[\mu g/m^3]$	$[\mu g/m^3]$
DPM	9901	1.1	5.0	--
1,1,1-Trichloroethane	71-55-6	--	1,000	68,000
Ammonia	7664-41-7	--	200	3,200
Benzene	71-43-2	0.10	3.0	27
Chloroform	67-66-3	0.019	300	150
p-Dichlorobenzene	106-46-7	0.040	800	--
Formaldehyde	50-00-0	0.021	9.0	55
Isomers of xylene	1330-20-7	--	700	22,000
Methylene Chloride	75-09-2	0.0035	400	14,000
Perchloroethylene	127-18-4	0.021	35	20,000
Toluene	108-88-3	--	300	37,000
Trichloroethylene	79-01-6	0.0070	600	--

Abbreviations:

Cal/EPA - California Environmental Protection Agency

DPM - Diesel Particulate Matter

REL - Reference Exposure Level

Sources:

California Environmental Protection Agency (Cal/EPA), Air Resources Board (ARB). 2011. Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values. February 14. Available at http://www.arb.ca.gov/toxics/healthval/contable.pdf.

Table 6
Wastewater Treament Plant Health Risk Assessment Summary
Point Molate
Richmond, California

Parcel/Location[1]		Cancer Risk (in a million)	Chronic HI (unitless ratio)	Acute HI (unitless ratio)	$PM_{2.5}$ Concentration ($\mu g/m^3$)
Parcel A		1.13	0.0039	0.028	8.1E-04
Parcel B		0.089	2.8E-04	0.0081	8.9E-05
Parcel C		0.019	3.0E-05	9.6E-04	2.1E-05
Parcel D		0.042	2.1E-05	1.4E-03	5.4E-05
Parcel E		0.017	3.7E-05	0.0037	1.5E-05
Parcel F		0.025	5.7E-05	0.0025	2.7E-05
Parcel G		0.023	4.0E-05	0.0020	2.7E-05
Parcel H		0.075	5.8E-05	0.0040	9.1E-05
Offsite		0.016	4.0E-05	0.0027	1.4E-05
Location[2]					
Onsite - Parcel A	UTMx	551,877	551,877	551,867	551,867
	UTMy	4,199,564	4,199,564	4,199,564	4,199,564
	Height	1.8	1.8	1.8	14
Offsite	UTMx	552,965	552,925	552,925	553,185
	UTMy	4,198,236	4,198,196	4,198,196	4,198,216
	Height	1.8	1.8	1.8	1.8

Notes

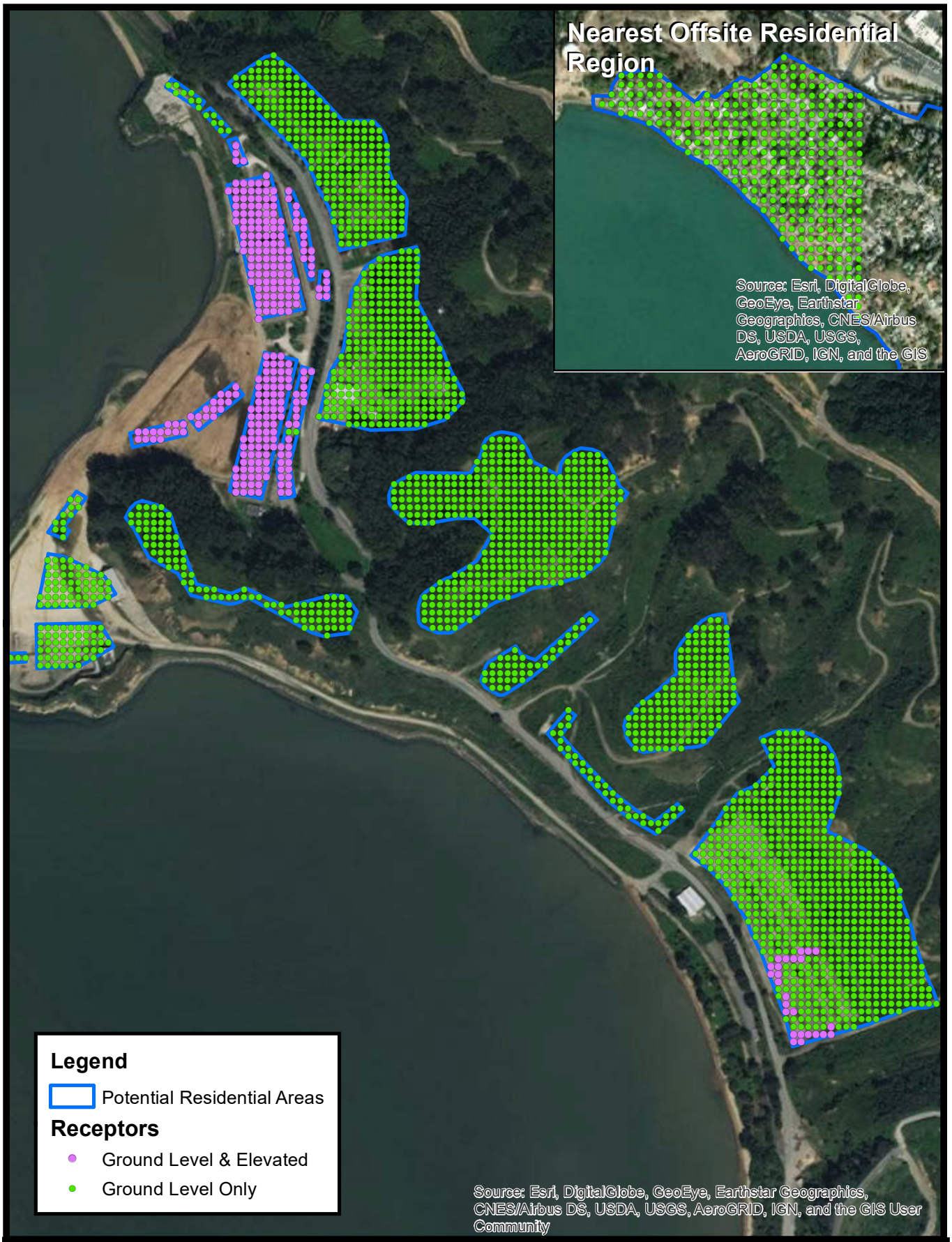
1. Risks were calculated at receptors covering all on-site residential buildings, as well as at the nearest off-site residences. All on-site receptors were modeled as potential residents exposed to risks for 30 years beginning during the third trimester. Risks are reported for the maximum-risk residential receptor found in each parcel or off-site area.

2. The location is given for the overall maximally-exposed individual resident (MEIR) both on-site and off-site.

Abbreviations

μg - micrograms
HI - health index
m -meter
MEIR - maximally exposed individual receptor
UTMx - universal transverse mercator x coordinate
UTMy - universal transverse mercator y coordinate

FIGURES



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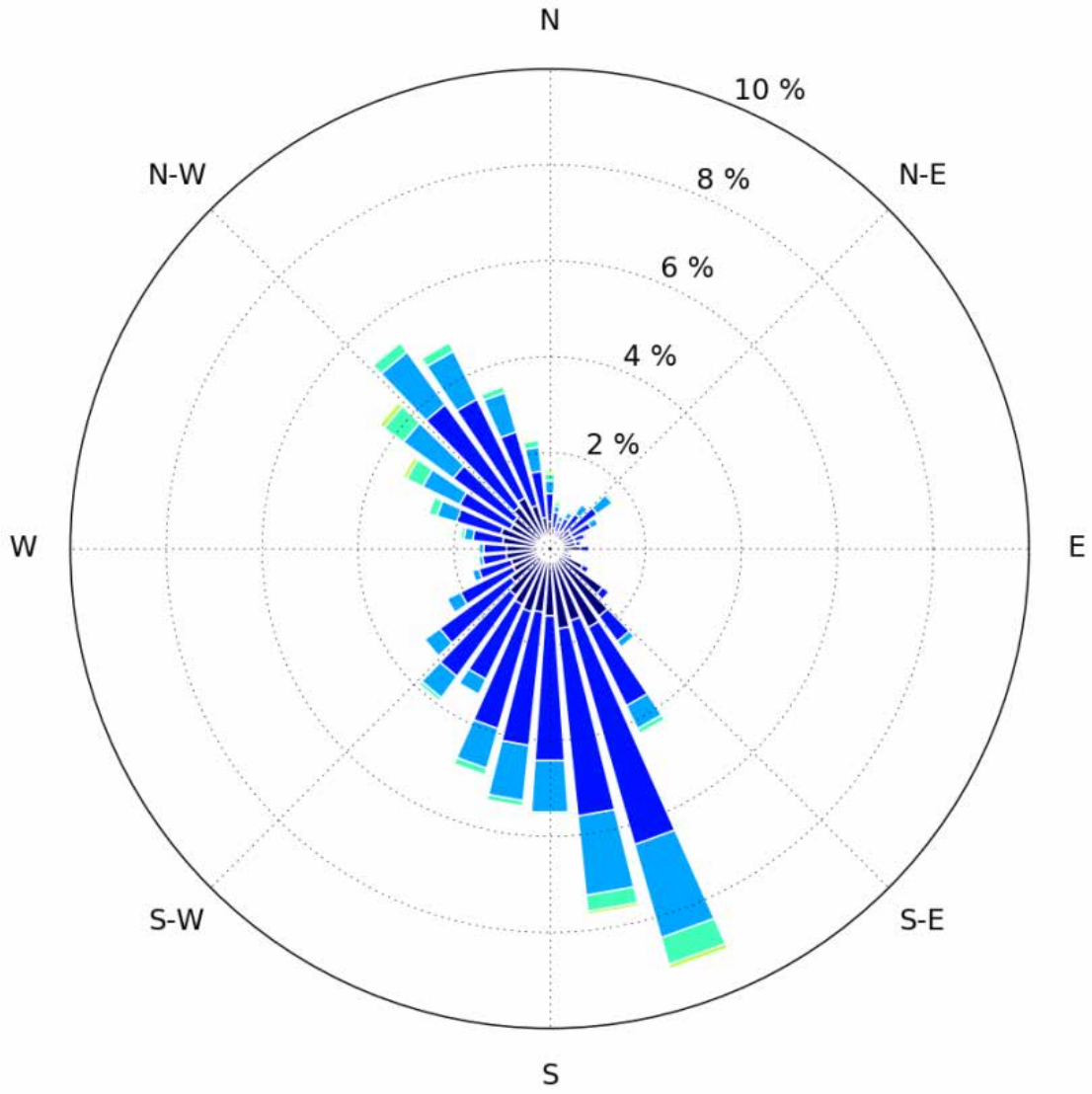
Modeled Receptors

Point Molate
Richmond, California

FIGURE
1

DRAFTED BY: EGR | DATE: 4/9/2020 | PROJECT: 1690014031-003



Wind speed (m/s)

- 0.5 to 2.0 m/s
- 2.0 to 4.0 m/s
- 4.0 to 6.0 m/s
- 6.0 to 8.0 m/s
- 8.0 to 10.0 m/s
- 10.0 to 12.0 m/s
- 12.0 m/s +

Dataset information:
(wind speed in m/s)

43800	total count
70	total calm
0.2	% calm
0	missing
0.0	% missing
2.9	wind speed avg.
0.5	min. wind speed
17.6	max. wind speed

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Windrose for Chevron Long Wharf
Point Molate
Richmond, California

FIGURE
2

DRAFTED BY: MJH | DATE: 09/17/19 | PROJECT: 1690014031-003

RAMBOLL

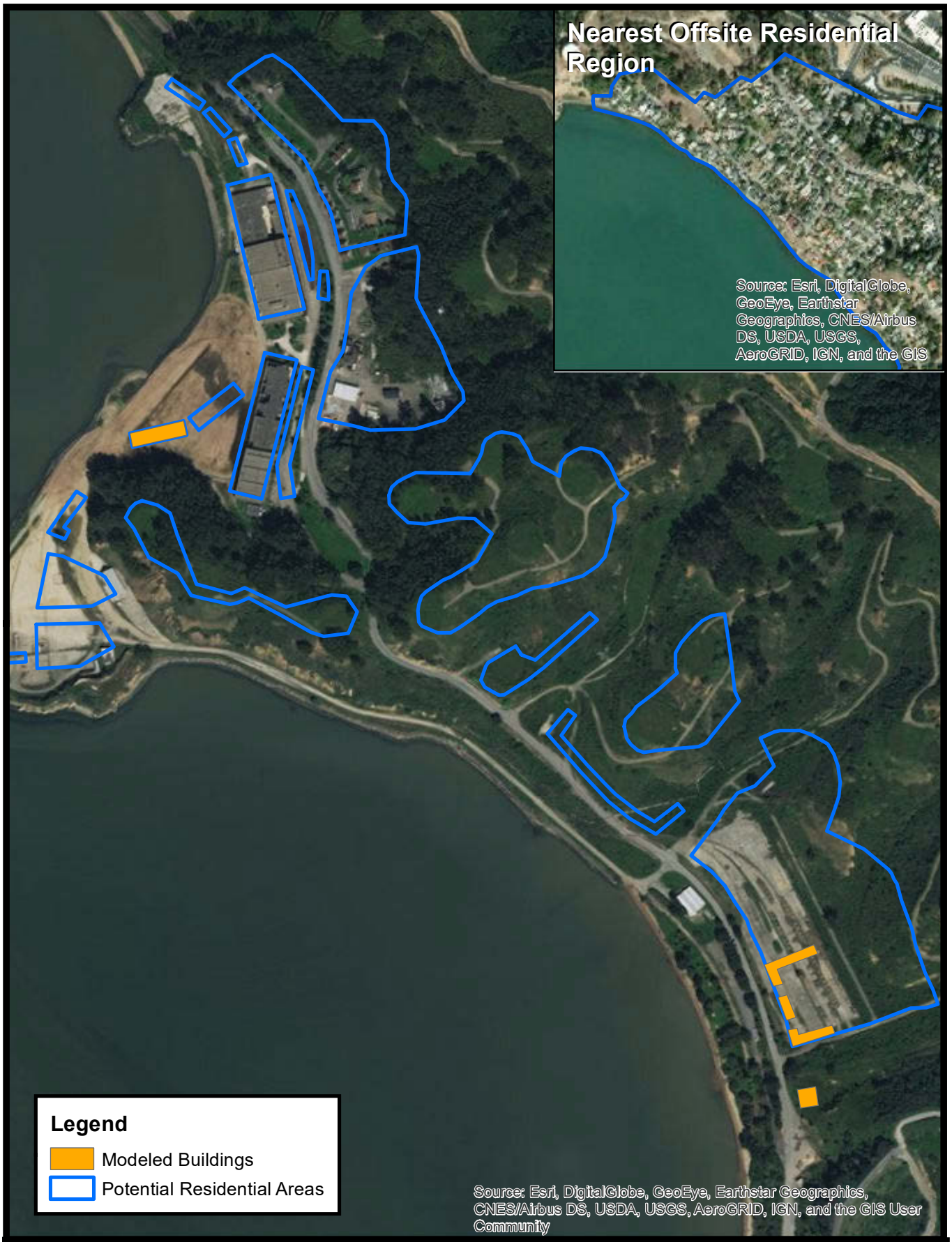
DRAFTED BY: EGR | DATE: 4/9/2020

Modeled Sources

Point Molate
Richmond, California

FIGURE
3

PROJECT: 1690014031-003



RAMBOLL

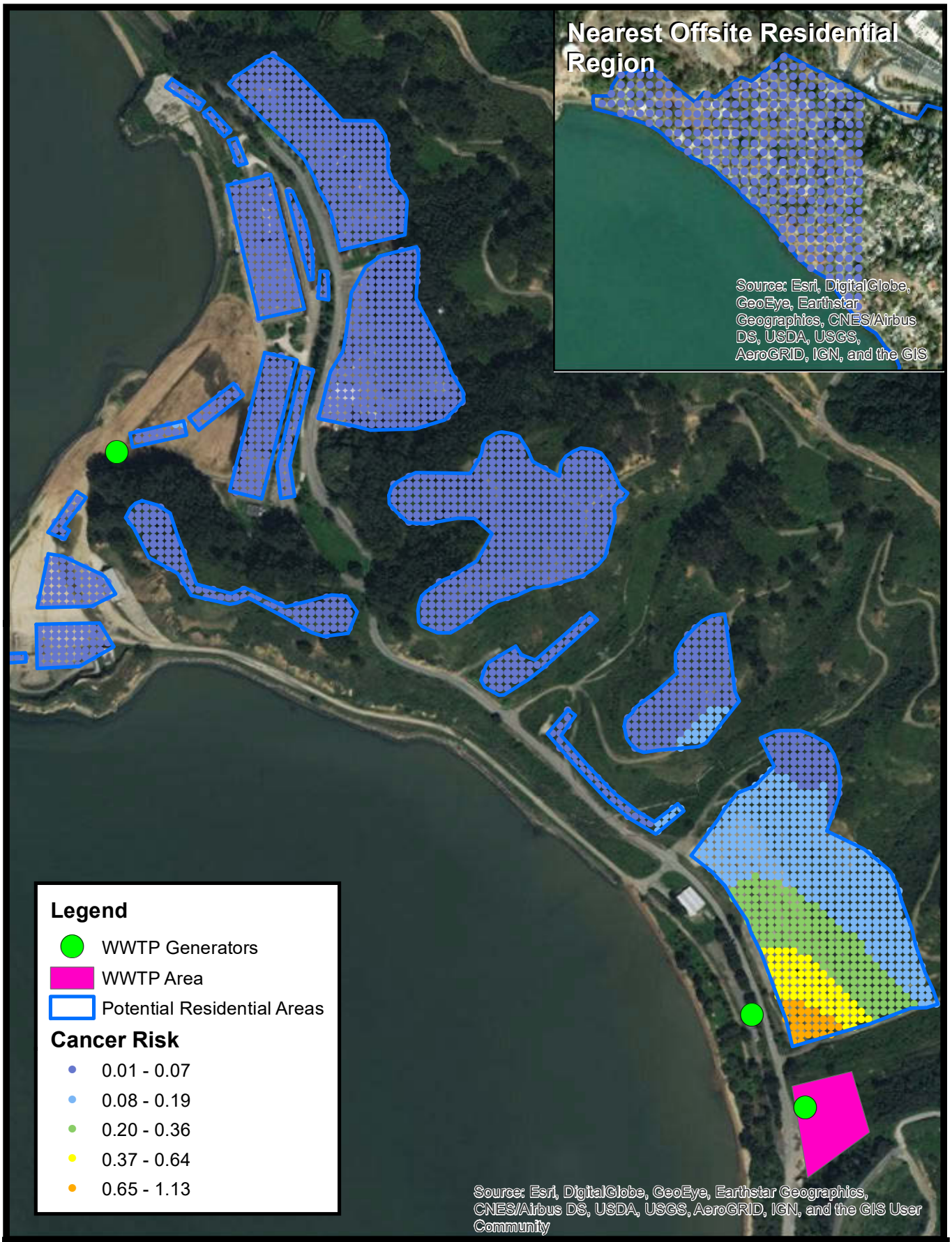
DRAFTED BY: EGR | DATE: 4/9/2020

Modeled Project Buildings

Point Molate
Richmond, California

FIGURE
4

PROJECT: 1690014031-003



RAMBOLL

Cancer Risk Impacts From WWTP

Point Molate
Richmond, California

FIGURE
5

DRAFTED BY: EGR | DATE: 4/9/2020 | PROJECT: 1690014031-003

APPENDIX A
SENSITIVE RECEPTOR SEARCH RESULTS

Point Molate
2100 Stenmark Dr
Richmond, CA 94801

Inquiry Number: 5744904.1s
August 07, 2019

EDR Offsite Receptor Report

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

TABLE OF CONTENTS

Thank you for your business
Please contact EDR at 1-800-352-0050
with any questions or comments.

EXECUTIVE SUMMARY

A search of available records was conducted by Environmental Data Resources, Inc. (EDR). The EDR Offsite Receptor Report provides information which may be used to comply with the Clean Air Act Risk Management Program 112-R. *"The rule requires that you estimate in the RMP residential populations within the circle defined by the endpoint for your worst-case and alternative release scenarios (i.e., the center of the circle is the point of release and the radius is the distance to the endpoint). In addition, you must report in the RMP whether certain types of public receptors and environmental receptors are within the circles."*

The address of the subject property, for which the search was intended, is:

POINT MOLATE
2100 STENMARK DR
RICHMOND, CA 94801

Distance Searched: 1.000 miles from subject property

RECEPTOR SUMMARY
An X indicates the presence of the receptor within the search radius.

Residential Population
Estimated population within search radius: 804 persons.

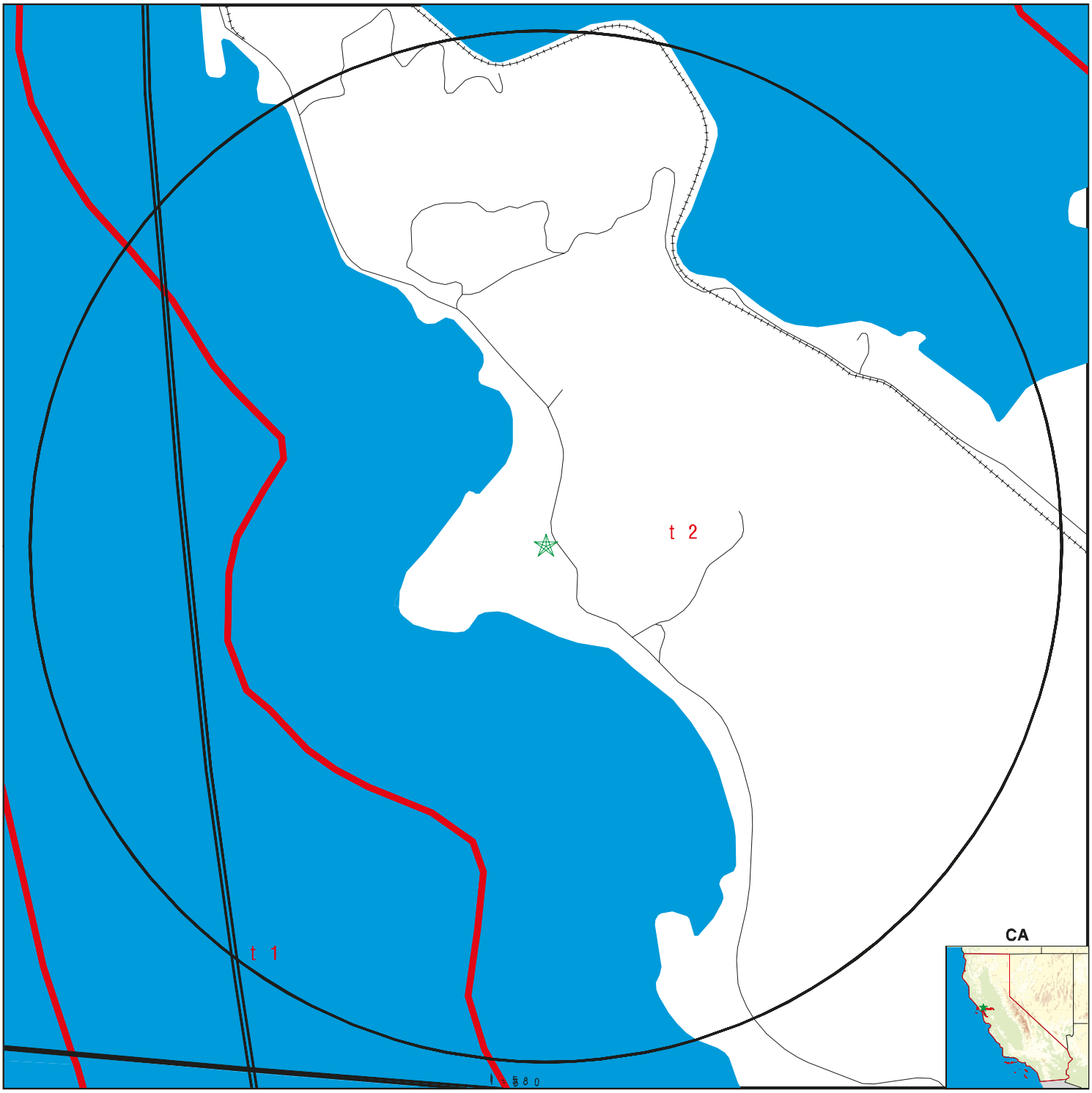
Other Public Receptors

Type	Within Search Radius	Sites Total
Day Care Centers:	☐	
Medical Centers:	☐	
Nursing Homes:	☐	
Schools:	☐	
Hospitals:	☐	
Colleges:	☐	
Arena:	☐	
Prison:	☐	

Environmental Receptors

Type	Within Search Radius	Sites Total
Federal Land:	☐	

CENSUS MAP - 5744904.1s



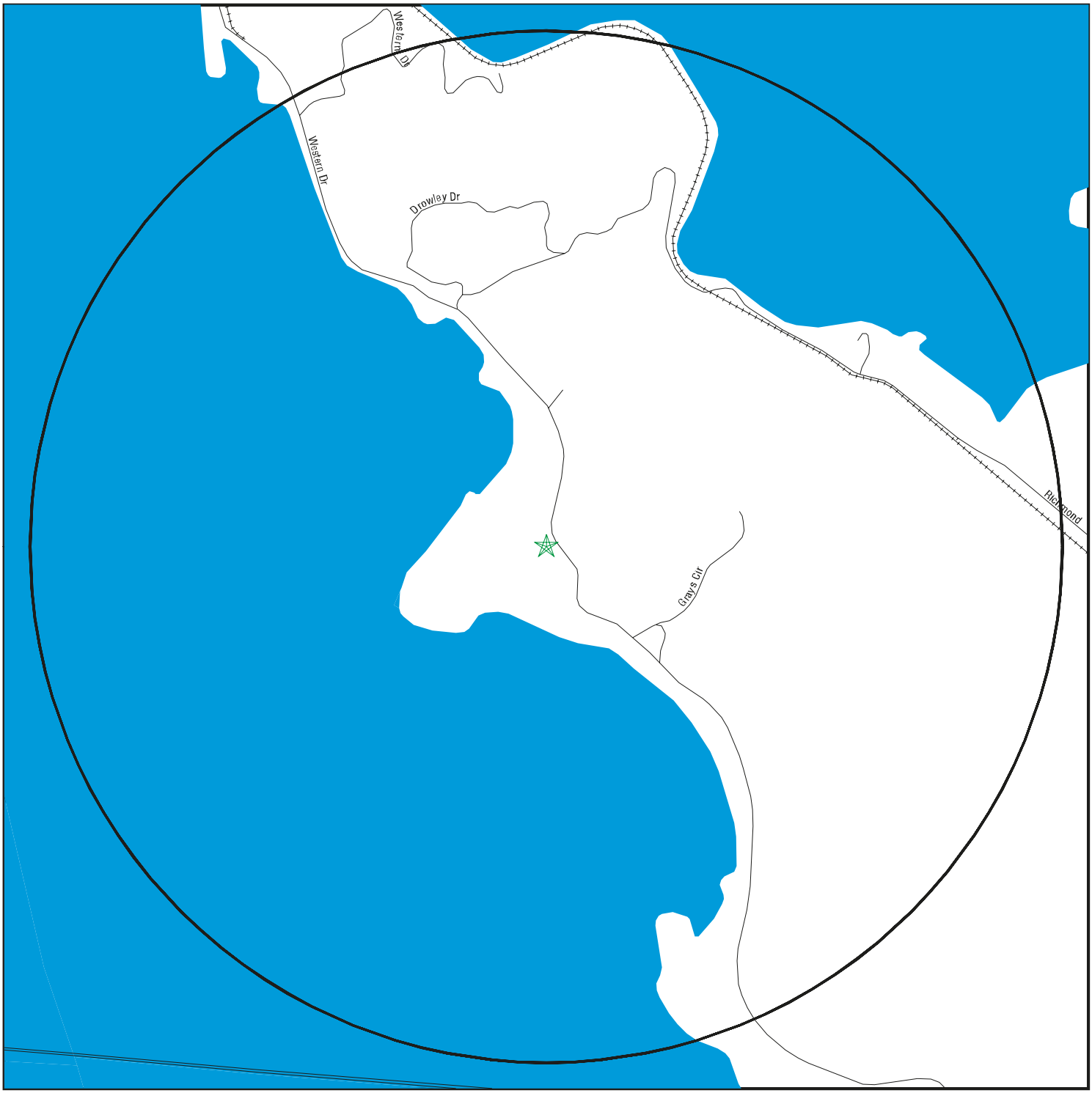
Target Property
Roads
Waterways
Census Tracts

TARGET PROPERTY:	Point Molate	CUSTOMER:	Ramboll
ADDRESS:	2100 Stenmark Dr	CONTACT:	Varsha Gopalakrishnan
CITY/STATE/ZIP:	Richmond CA 94801	INQUIRY #:	5744904.1s
LAT/LONG:	37.9486 / 122.4171	DATE:	August 07, 2019 4:44 pm

CENSUS FINDINGS

Map ID	Tract Number	Total Population	Population in Radius	Total Area(sq.mi.)	Area in Radius(sq.mi.)
T1	9900.00	0	0.0	33.20	0.62
T2	3780.00	3435	804.4	10.68	2.50

RECEPTOR MAP - 5744904.1s



- Target Property
- Roads
- Waterways
- Environmental or Public Receptor
- Federal Lands Linear Features
- Federal Lands Area

0 1/4 1/2 1 Miles

N

TARGET PROPERTY:	Point Molate	CUSTOMER:	Ramboll
ADDRESS:	2100 Stenmark Dr	CONTACT:	Varsha Gopalakrishnan
CITY/STATE/ZIP:	Richmond CA 94801	INQUIRY #:	5744904.1s
LAT/LONG:	37.9486 / 122.4171	DATE:	August 07, 2019 4:45 pm

MAP FINDINGS

Map ID Direction Distance Distance (ft.) Elevation	Site	EDR ID Database

No Sites Reported.

RECORDS SEARCHED/DATA CURRENCY TRACKING

Census

Source: U.S. Census Bureau
Telephone: 301-763-4636
2010 U.S. Census data was used to estimate residential population following these EPA guidelines:
"Census data are presented by Census tract. If your circle covers only a portion of the tract, you should develop an estimate for that portion...Determine the population density per square mile (total population of the Census tract divided by the number of square miles in the tract) and apply that density figure to the number of square miles within your circle."

FED_LAND: Federal Lands

Source: USGS
Telephone: 888-275-8747
Federal lands data. Includes data from several Federal land management agencies, including Fish and Wildlife Service, Bureau of Land Management, National Park Service, and Forest Service. Includes National Parks, Forests, Monuments; . Wildlife Sanctuaries, Preserves, Refuges; Federal Wilderness Areas.

AHA Hospitals:

Source: American Hospital Association, Inc.
Telephone: 312-280-5991
The database includes a listing of hospitals based on the American Hospital Association's annual survey of hospitals.

Medical Centers: Provider of Services Listing

Source: Centers for Medicare & Medicaid Services
Telephone: 410-786-3000
A listing of hospitals with Medicare provider number, produced by Centers of Medicare & Medicaid Services, a federal agency within the U.S. Department of Health and Human Services.

Nursing Homes

Source: National Institutes of Health
Telephone: 301-594-6248
Information on Medicare and Medicaid certified nursing homes in the United States.

Public Schools

Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on elementary and secondary public education in the United States. It is a comprehensive, annual, national statistical database of all public elementary and secondary schools and school districts, which contains data that are comparable across all states.

Private Schools

Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on private school locations in the United States.

Colleges - Integrated Postsecondary Education Data

Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on integrated postsecondary education in the United States.

Arenas

Source: Dunhill International
EDR indicates the location of buildings and facilities - arenas - where individuals who are public receptors are likely to be located.

Prisons: Bureau of Prisons Facilities

Source: Federal Bureau of Prisons
Telephone: 202-307-3198
List of facilities operated by the Federal Bureau of Prisons.

Daycare Centers: Licensed Facilities

Source: Department of Social Services
Telephone: 916-657-4041

STREET AND ADDRESS INFORMATION

APPENDIX B
AERMOD INPUT FILES (PROVIDED ELECTRONICALLY)