APPENDIX C

Community Risk Overlays in Fremont

Appendix C

Community Risk Overlays in Fremont

The BAAQMD CEQA Air Quality Guidelines state that for General Plans to have less than significant impacts with respect to potential toxic air contaminants (TACs), special overlays should be established around existing and proposed sources. The special overlays are then used in developing General Plan policies to minimize impacts. This appendix describes risk modeling for the major sources in Fremont. These include roadways, rail lines and stationary sources.

Roadway Community Risk Impacts

Several major roadway segments in Fremont were evaluated for community risk impacts. The analysis is meant to show screening level community risk in Fremont along major highways and arterial roads. Both traffic and roadway orientation has a considerable effect on the level of community risk along these roadways. Traffic levels, especially diesel truck traffic, substantially affect emissions. Roadway orientation is important when considering the dispersion characteristics in Fremont. The following roadway segments were evaluated:

- Interstate 880 (between Thorton Ave and Decoto Rd)
- Interstate 880 (between Auto Mall Pkwy and Stevenson Blvd)
- Interstate 680 (between Auto Mall Pkwy and Washington Blvd)
- Interstate 680 (between Washington Blvd and Mission Blvd)
- Mission Blvd (between Driscoll Rd and Stevenson Blvd)
- Mowry Ave (between Blacow Rd and Fremont Blvd)
- Fremont Blvd (between Stevenson Blvd and Mowry Ave)

<u>Methodology</u>

The analysis involved the development of roadway emissions for existing and future conditions, dispersion modeling to predict annual TAC concentrations, and a cancer risk assessment. The methodology used to conduct each step of the analysis is described below.

<u>Emissions Modeling</u>
This analysis involved the development of future DPM, organic TAC and $PM_{2.5}$ emissions for traffic using the latest version of the CARB EMFAC2007 emission factor model with the traffic mix developed from Caltrans and model defaults for Alameda County, except where as noted. EMFAC2007 is the most recent version of the CARB motor vehicle emission factor model. DPM emissions are predicted by the model to decrease in the future.

The volume of traffic as well as the vehicle mix is an important factor in estimating vehicle emissions. Heavy-duty diesel trucks emit a vast majority of the diesel particulate matter along Bay Area roads. Caltrans reports average annual daily traffic volumes on State highways, which includes traffic volumes broken down by the number of axles[1]. The Caltrans reported volumes

[1] Caltrans, Based on 2009 Average Annual Daily Truck Traffic on the California State Highway System -

and traffic mix were applied to the roadway segments for I-880, I-680, and SR-238 (Mission Boulevard). General Plan traffic volumes for Mowry Ave and Fremont Boulevard were used. The traffic mix for these roadways was estimated based on traffic counts that were conducted during noise measurements supporting the General Plan noise analyses. Traffic counts for local roadways indicated that 97-percent of the traffic are light-duty passenger vehicles and trucks, 1-percent are delivery type trucks (medium-duty trucks), 1-percent are large diesel trucks (heavy-duty trucks), and 1-percent are buses. This traffic mix was incorporated into the emissions analysis.

Vehicle emissions were developed for the years 2010 and 2020. The current version of EMFAC2007 does not incorporate the effects of the recent on-road diesel vehicle regulations, which will substantially reduce DPM emissions even further. The requirements for diesel trucks are phased in for future years and depend on the model year of the trucks. Since this analysis assesses the long-term risk of proposed sensitive uses to future exposures, the lower future emissions were taken into account. The diesel truck age distribution used in the EMFAC2007 model was adjusted to reflect the effects of the new regulations. These adjustments include recent action by CARB to delay some of the requirements of the regulation.

CARB's new regulations require on-road diesel trucks to be retrofitted with particulate matter controls or replaced to meet new 2010 engine standards that have much lower DPM and $PM_{2.5}$ emissions[2]. This regulation will substantially reduce these emissions between 2013 and 2023, with the greatest reductions occurring in 2015 through 2020. While new trucks and buses will meet strict federal standards, this measure is intended to accelerate the rate at which the fleet either turns over so there are cleaner vehicles on the road, or retrofitted to meet similar standards. With this regulation, older, more polluting trucks would be removed from the roads much quicker. CARB anticipates a 68 percent reduction in $PM_{2.5}$ (including DPM) emission from trucks in 2014 with this regulation.

The requirements for diesel trucks are phased in for future years and depend on the model year of the trucks. Since this analysis assesses the risk of proposed sensitive uses to future exposures, the lower future emissions were taken into account. The diesel truck age distribution used in the EMFAC2007 model for the years 2020 (and beyond) was adjusted to reflect the effects of the new regulations. The EMFAC2007 results were then adjusted to the traffic volume and mix.

Average daily traffic volumes were assumed to increase in the future. The rate of traffic growth under the General Plan was computed based on existing and General Plan 2035 conditions. The growth rate for each roadway was applied to the existing volumes to predict future traffic conditions.

DPM emission factors were developed for the years 2010 and 2020 using the calculated mix of cars and trucks on freeways and highway reported by Caltrans (I-880, I-680, and SR-238) and the traffic counts for Mowry Ave and Fremont Blvd. For emission year 2010, which applies to years 2010 – 2020, the default model emissions that did not assume any effect of CARB regulations were used to calculate emissions with EMFAC2007. For emission year 2020, which

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http://www.dot.ca.gov/hq/traffops/saferesr/trafdata/

[2] The 2010 Engine standards apply to new trucks sold, and therefore, the fleet emissions are affected over time as the newer trucks replace older trucks.

applies to years 2020 onward, model years 2005 – 2020 were used to calculate emissions with EMFAC2007.

Emissions of total organic gases (TOG) and $PM_{2.5}$ were also calculated for 2010 and 2020 using the EMFAC2007 model. These TOG emissions were then used in the modeling the organic TACs. TOG emissions from both exhaust and from running evaporative losses from all vehicle types were calculated using EMFAC2007 default model values for Alameda County along with the traffic volumes and vehicle mixes for freeways, highways and local roadways. The model year adjustments for diesel vehicles, discussed above, were not used when calculating TOG emissions.

The EMFAC2007 model was also used to develop average hourly traffic distributions for Alameda County roadways, which were then applied to the average daily traffic volumes for freeways and local roadways to obtain hourly traffic volumes. Average freeway travel speeds of 55 mph were used for I-880 and I-680, except congested periods that were modeled at 15 mph. An average speed of 30 mph was used for traffic on Mission Boulevard and 25 mph for Mowry Ave and Fremont Blvd.

Roadway Dispersion Modeling

Dispersion modeling of DPM and organic TAC emissions from traffic was conducted using the CAL3QHCR model, which is recommended by the BAAQMD for this type of analysis. Inputs to the model included road geometry, hourly traffic volumes, and the DPM and $PM_{2.5}$ emission factors. The aerial view each modeling segments are provided in the attached figures.

Hourly meteorological data were used in the modeling, along with hourly traffic volumes and emission rates. The meteorological were obtained from BAAQMD's website[3]. A set of 5-year hourly meteorological data (1990 – 1994) for Fremont was used to represent the northern Fremont roadways and the only available 4-year set (2002-05) collected at the former NUMI plant was used to represent the southern I-880 and I-680 segments.

Roadway links were extended at 1,000 feet in each direction (2,000-foot long links). Roadway widths were defined by the number of lanes, assuming 12-foot wide lanes. The entire sites were assumed to be flat (i.e., flat terrain). Receptors were placed in a line normal to the middle of the roadway links at distances ranging from 50 feet to 1,000 feet from the edge of the roadways. Receptor heights were five feet above ground.

Community Risk Assessment – Cancer Risk from Roadways

Using the modeled long-term average DPM and organic gas concentrations, the individual cancer risks were computed using methods recommended by BAAQMD[4] and the California Office of Environmental Health Hazard Assessment (OEHHA).[5]

The factors used to compute cancer risk are highly dependent on modeled concentrations,

[3] http://hank.baaqmd.gov/tec/data/
[4] BAAQMD, *Air Toxics NSR Program Health Risk Screening Analysis (HSRA) Guidelines*, January 2010.
[5] OEHHA 2003. *Air Toxics Hot Spots Program Risk Assessment Guidelines, The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments.* Office of Environmental Health Hazard Assessment. August 2003.

exposure period or duration, and the type of receptor. The exposure level is determined by the modeled concentration; however, it has to be averaged over a representative exposure period. The averaging period is dependent on many factors, but mostly the type of sensitive receptor that would reside at a site. This assessment conservatively assumed long-term residential exposures. OEHHA has developed exposure assumptions for typical types of sensitive receptors. These include nearly continuous exposures of 70 years for residences. It should be noted that the cancer risk calculations for 70-year residential exposures reflect use of BAAQMD's most recent cancer risk calculation method, adopted in January 2010. This method applies a Cancer Risk Adjustment Factor of 1.7 to the cancer risks for residential exposures, accounting for age sensitivity to toxic air contaminants. Age-sensitivity factors reflect the greater sensitivity of infants and small children to cancer causing TACs.

Cancer risk caused by exposure to DPM and total organic TACs from vehicle exhaust was predicted. This analysis presents the cancer risk for residential types of uses where exposures are assumed to be nearly continuous for 70 years. Since risk of cancer is computed over a lifetime, the predicted change in exposure was accounted for where traffic and emission rates would change. Cancer risk was predicted beginning in the year 2010. The exposures were weighted over 70 years, using predictions for 2010 and 2020. The year 2020 conditions were assumed to persist for the 60-year exposure period beyond 2020. Under the BAAQMD CEQA Air Quality Guidelines, an incremental risk of greater than 10 cases per million from a single source at the Maximally Exposed Individual (MEI) would result in a significant impact.

Community Risk Assessment – Hazard Impacts

Potential non-cancer health effects due to chronic exposure to DPM were not estimated since the concentration threshold for non-cancer effects is considerably higher than concentrations that would result in significant cancer risks that were described above. The chronic inhalation reference exposure level (REL) for DPM is 5 $\mu g/m^3$. The DPM air quality assessment predicted a maximum annual exposure much lower than the REL. Thus, the Hazard Index (HI), which is the ratio of the annual DPM concentration to the REL, would be much lower than significance criterion of a HI greater than 1.0. Similarly to DPM, the concentrations of organic TACs would be much lower than the toxicity-weighted, chronic non-cancer RELs for the mix of organic TACs in the TOG from tailpipe exhaust emissions and from evaporative losses[6]. This is consistent with the BAAQMD Screening Tables published for Alameda County roadways in Fremont.

Community Risk Assessment - PM2.5 Concentrations

In addition to evaluating the health risks from TACs, potential impacts from $PM_{2.5}$ emissions from traffic were evaluated. $PM_{2.5}$ concentrations were modeled to evaluate the potential impact of exposure to exhaust produced from traffic. To evaluate potential non-cancer health effects due to $PM_{2.5}$, the BAAQMD had adopted a significance threshold of an annual average $PM_{2.5}$ concentration greater than 0.3 $\mu g/m^3$.

[6] BAAQMD, *Recommended Methods for Screening and Modeling Local Risks and Hazards*, May 2010.

The same basic modeling approach that was used for assessing TAC impacts was used in the modeling of $PM_{2.5}$ concentrations from traffic. $PM_{2.5}$ emissions from all vehicles were used, rather than just the diesel powered vehicles, because all vehicle types (i.e., gasoline and diesel powered) produce $PM_{2.5.}$

The assessment involved, first, calculating $PM_{2.5}$ emission rates from traffic, and then, dispersion modeling using emission factors and traffic volumes was applied. The dispersion model provides estimated annual $PM_{2.5}$ concentrations. $PM_{2.5}$ emissions were calculated using the EMFAC2007 model for the mix of traffic on the highways and local roads for 2010 and 2020. Hourly traffic volumes were also calculated in the same manner as discussed earlier for the TAC modeling. The concentrations reported are the maximum annual $PM_{2.5}$ levels modeled for either 2010 or 2020.

Results - Predicted Cancer Risk and Annual PM2.5 Concentrations

The predicted cancer risk and annual PM2.5 concentrations are presented in this section. Cancer risk predictions are conservative when compared with BAAQMD modeling procedures for the following reasons:

Emissions are presented for only two years, 2010 and 2020. Emissions are predicted to decrease substantially between 2010 and 2020, especially after 2015. Any new development undertaken as part of the General Plan would likely occur near or after 2015 when lower emission rates and resulting cancer risks would occur.

The roadway segments used are based on 2,000-foot long links. BAAQMD guidance recommends that only the portion of sources within 1,000 be assessed. As receptors are located further from the roadways, the portion of the source within 1,000 feet decreases. For example, very little roadway is located within 1,000 feet of receptors located beyond 500 feet.

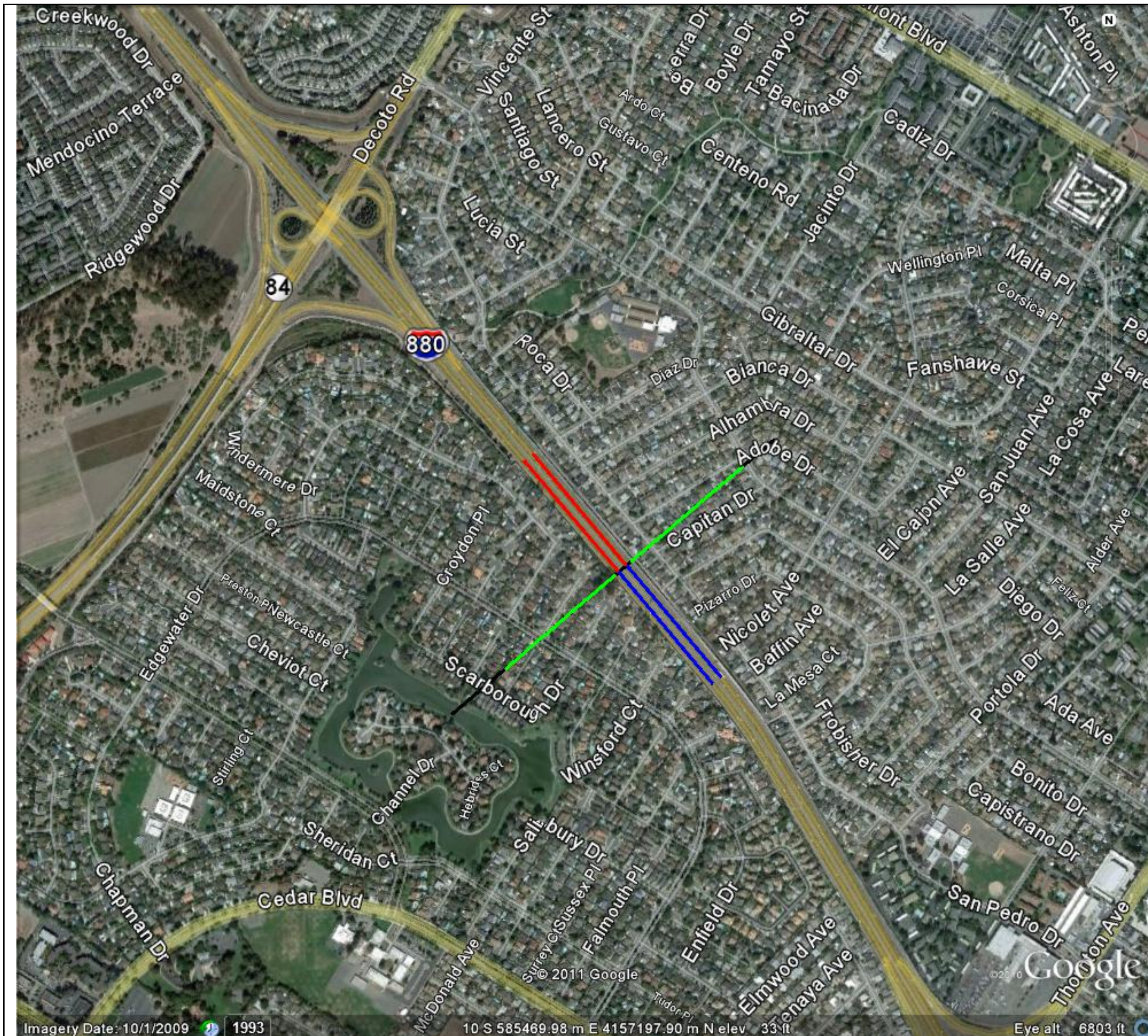
The predicted cancer risks are presented as follows:

Roadway (segment)	50ft	100ft	200ft	300ft	400ft	500ft	600ft	700ft	800ft	900ft	1000ft
	Weighted Lifetime Cancer Risk (chances in one million)										
West of I-880 (Thorton to Decoto)	116.8	78.5	47.5	33.3	25.5	20.7	17.1	14.5	12.4	10.9	**9.6**
East of I-880 (Thorton to Decoto)	127.0	92.4	56.3	38.4	27.5	20.6	15.9	12.5	**10.0**	8.2	6.9
West of I-880 (Stevenson to Auto Mall)	96.6	64.5	38.6	27.1	20.5	16.5	13.6	11.3	**9.8**	8.5	7.5
East of I-880 (Stevenson to Auto Mall)	65.3	48.2	29.4	20.7	15.2	11.9	**9.4**	7.6	6.4	5.4	4.6
West of I-680 (north of Auto Mall Drive)	167.5	118.0	73.6	53.5	41.7	33.9	28.3	24.1	20.9	18.3	**16.2**
East of I-680 (north of Auto Mall Drive)	176.5	124.2	77.3	53.4	39.6	30.5	24.1	19.8	16.4	13.9	**11.9**
North of I-680 (Washington to Mission Blvd.)	128.4	63.5	39.2	27.5	21.2	16.4	13.3	11.1	**9.3**	8.2	7.1
South of I-680 (Washington to Mission Blvd.)	175.7	109.6	68.9	49.9	39.4	32.0	26.8	22.8	19.7	17.3	**15.5**
West of Mission Boulevard (Driscoll Rd to Stevenson Rd)	10.5	**6.4**	3.7	2.5	1.8	1.4	1.2	1.0	0.8	0.7	0.6
East of Mission Boulevard (Driscoll Rd to Stevenson Rd)	10.5	**6.7**	3.8	2.5	1.8	1.3	1.0	0.8	0.6	0.5	0.4
North of Mowry Ave (Blacow to Fremont Ave)	6.1	4.2	2.6	1.9	1.4	1.1	0.9	0.7	0.6	0.5	0.4
South of Mowry Ave (Blacow to Fremont Ave)	9.2	6.2	3.9	2.8	2.2	1.8	1.6	1.3	1.2	1.0	0.9
West of Fremont Ave (Stevenson to Mowry Ave)	5.5	3.5	2.0	1.3	1.0	0.7	0.6	0.5	0.4	0.3	0.3
East of Fremont Ave (Stevenson to Mowry Ave)	5.1	3.2	1.8	1.2	0.9	0.6	0.5	0.4	0.3	0.3	0.2

The predicted maximum annual $PM_{2.5}$ concentrations are presented as follows:

	Annual $PM_{2.5}$ Concentration ($\mu g/m^3$)										
Roadway (segment)	**50ft**	**100ft**	**200ft**	**300ft**	**400ft**	**500ft**	**600ft**	**700ft**	**800ft**	**900ft**	**1000ft**
West of I-880 (Thorton to Decoto)	0.79	0.52	0.31	**0.22**	0.17	0.13	0.11	0.09	0.08	0.07	0.06
East of I-880 (Thorton to Decoto)	0.96	0.69	0.42	**0.28**	0.20	0.15	0.11	0.09	0.07	0.06	0.05
West of I-880 (Stevenson to Auto Mall)	0.79	0.51	**0.30**	0.21	0.15	0.12	0.10	0.08	0.07	0.06	0.05
East of I-880 (Stevenson to Auto Mall)	0.57	0.41	**0.25**	0.17	0.13	0.10	0.08	0.06	0.05	0.04	0.04
West of I-680 (north of Auto Mall Drive)	0.79	0.55	0.33	**0.24**	0.19	0.15	0.12	0.11	0.09	0.08	0.07
East of I-680 (north of Auto Mall Drive)	0.94	0.66	0.41	**0.28**	0.21	0.16	0.12	0.10	0.08	0.07	0.06
North of I-680 (Washington to Mission Blvd.)	0.66	0.33	**0.20**	0.14	0.11	0.09	0.07	0.06	0.05	0.04	0.04
South of I-680 (Washington to Mission Blvd.)	0.99	0.62	0.39	**0.29**	0.23	0.19	0.16	0.13	0.12	0.10	0.09
West of Mission Boulevard (Driscoll Rd to Stevenson Rd)	0.08	0.05	0.03	0.02	0.01	0.01	0.01	0.01	0.01	0.00	0.00
East of Mission Boulevard (Driscoll Rd to Stevenson Rd)	0.09	0.06	0.03	0.02	0.01	0.01	0.01	0.01	0.00	0.00	0.00
North of Mowry Ave (Blacow to Fremont Ave)	0.10	0.07	0.04	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01
South of Mowry Ave (Blacow to Fremont Ave)	0.18	0.12	0.07	0.05	0.04	0.04	0.03	0.03	0.02	0.02	0.02
West of Fremont Ave (Stevenson to Mowry Ave)	0.10	0.06	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.00
East of Fremont Ave (Stevenson to Mowry Ave)	0.10	0.06	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.00	0.00

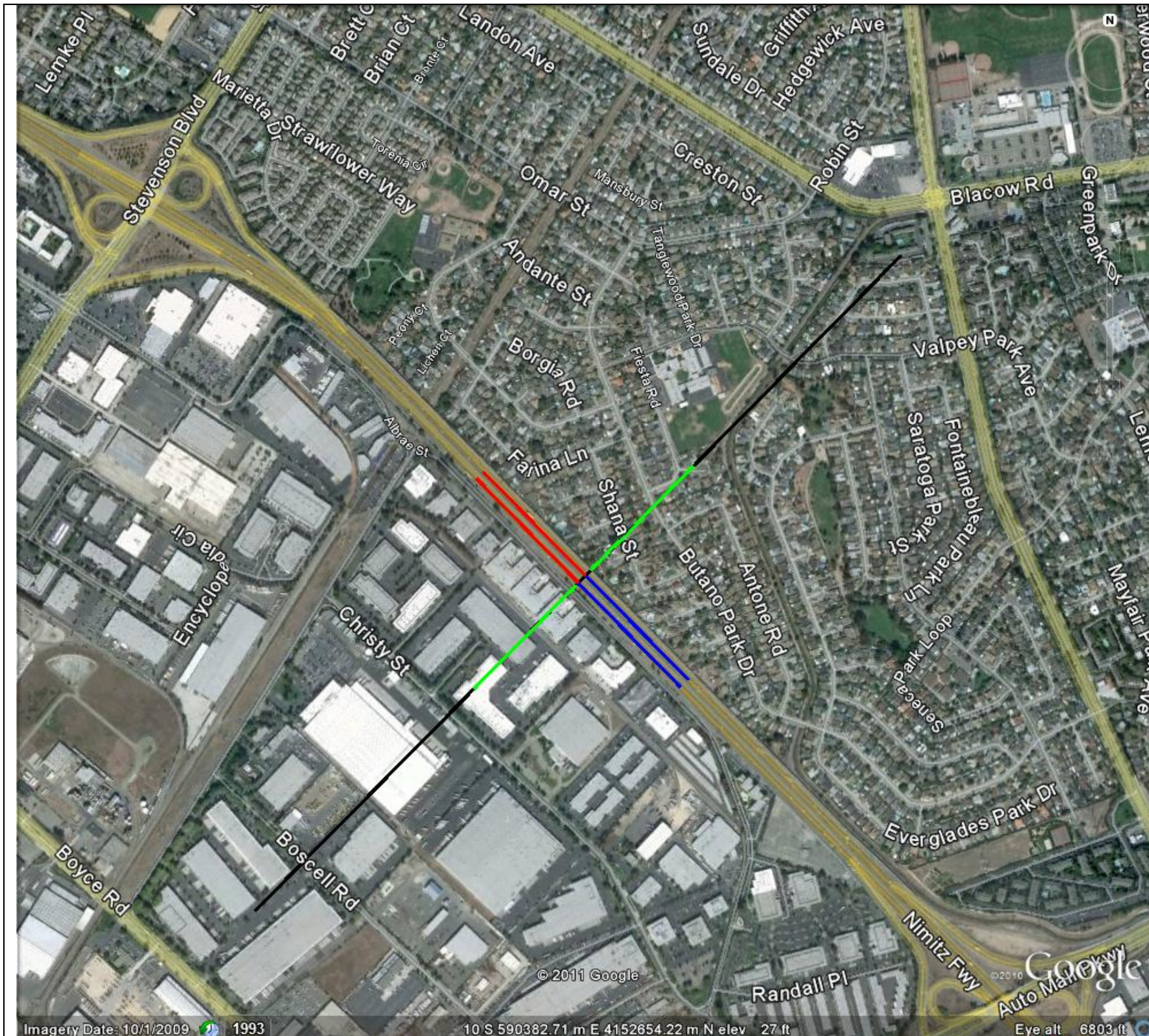
Interstate 880 – Thorton Ave to Decoto Road



Weighted Lifetime Cancer Risk (chances in one million)											
Roadway (segment)	**50ft**	**100ft**	**200ft**	**300ft**	**400ft**	**500ft**	**600ft**	**700ft**	**800ft**	**900ft**	**1000ft**
West of I-880	116.8	78.5	47.5	33.3	25.5	20.7	17.1	14.5	12.4	10.9	**9.6**
East of I-880	127.0	92.4	56.3	38.4	27.5	20.6	15.9	12.5	**10.0**	8.2	6.9

Annual $PM_{2.5}$ Concentration (μg/m^3)											
Roadway (segment)	**50ft**	**100ft**	**200ft**	**300ft**	**400ft**	**500ft**	**600ft**	**700ft**	**800ft**	**900ft**	**1000ft**
West of I-880	0.79	0.52	0.31	**0.22**	0.17	0.13	0.11	0.09	0.08	0.07	0.06
East of I-880	0.96	0.69	0.42	**0.28**	0.20	0.15	0.11	0.09	0.07	0.06	0.05

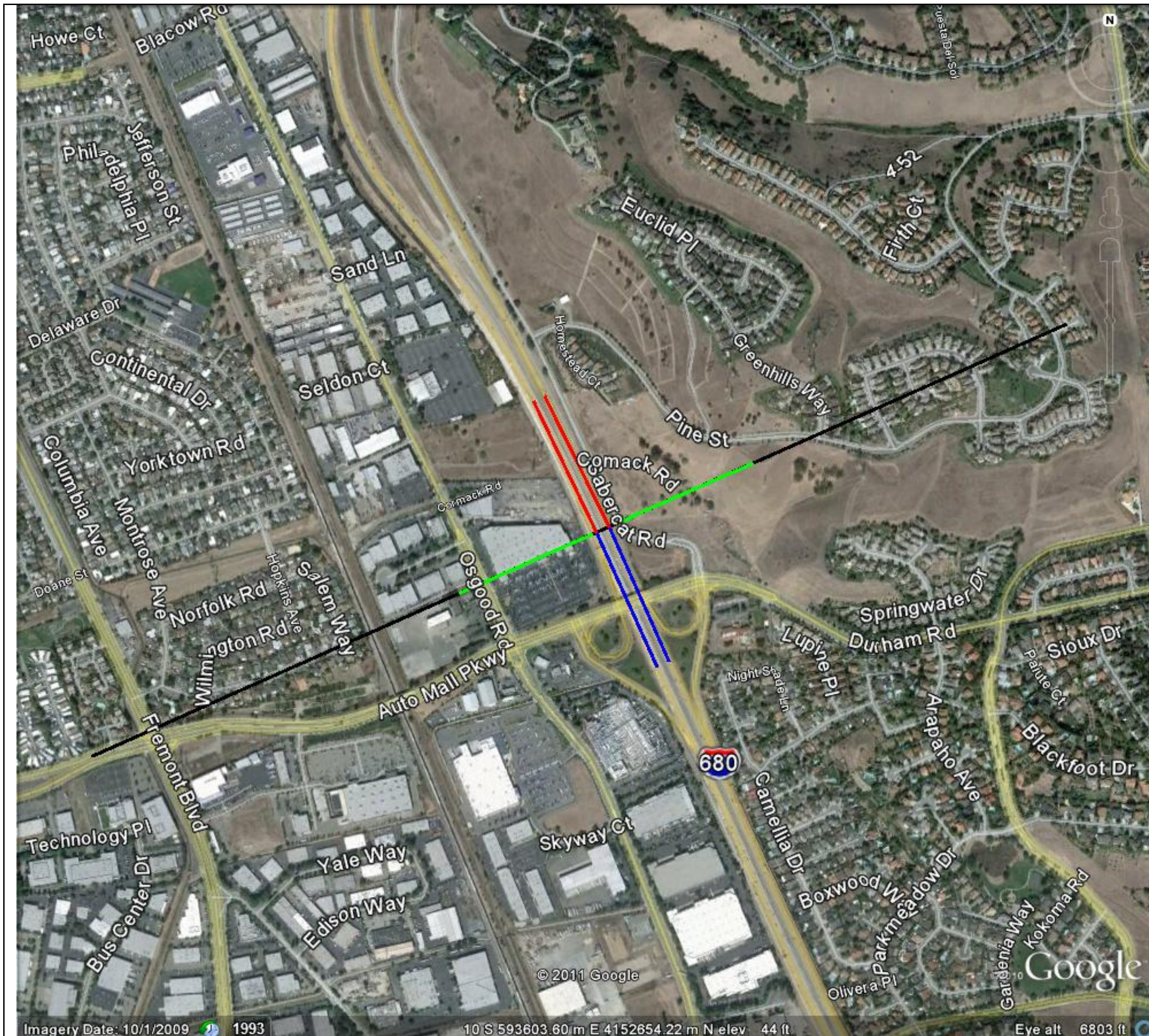
Interstate 880 – Auto Mall Pkwy to Stevenson Road



Weighted Lifetime Cancer Risk (chances in one million)											
Roadway (segment)	**50ft**	**100ft**	**200ft**	**300ft**	**400ft**	**500ft**	**600ft**	**700ft**	**800ft**	**900ft**	**1000ft**
West of I-880	96.6	64.5	38.6	27.1	20.5	16.5	13.6	11.3	**9.8**	8.5	7.5
East of I-880	65.3	48.2	29.4	20.7	15.2	11.9	**9.4**	7.6	6.4	5.4	4.6

Annual $PM_{2.5}$ Concentration (μg/m^3)											
Roadway (segment)	**50ft**	**100ft**	**200ft**	**300ft**	**400ft**	**500ft**	**600ft**	**700ft**	**800ft**	**900ft**	**1000ft**
West of I-880	0.79	0.51	**0.30**	0.21	0.15	0.12	0.10	0.08	0.07	0.06	0.05
East of I-880	0.57	0.41	**0.25**	0.17	0.13	0.10	0.08	0.06	0.05	0.04	0.04

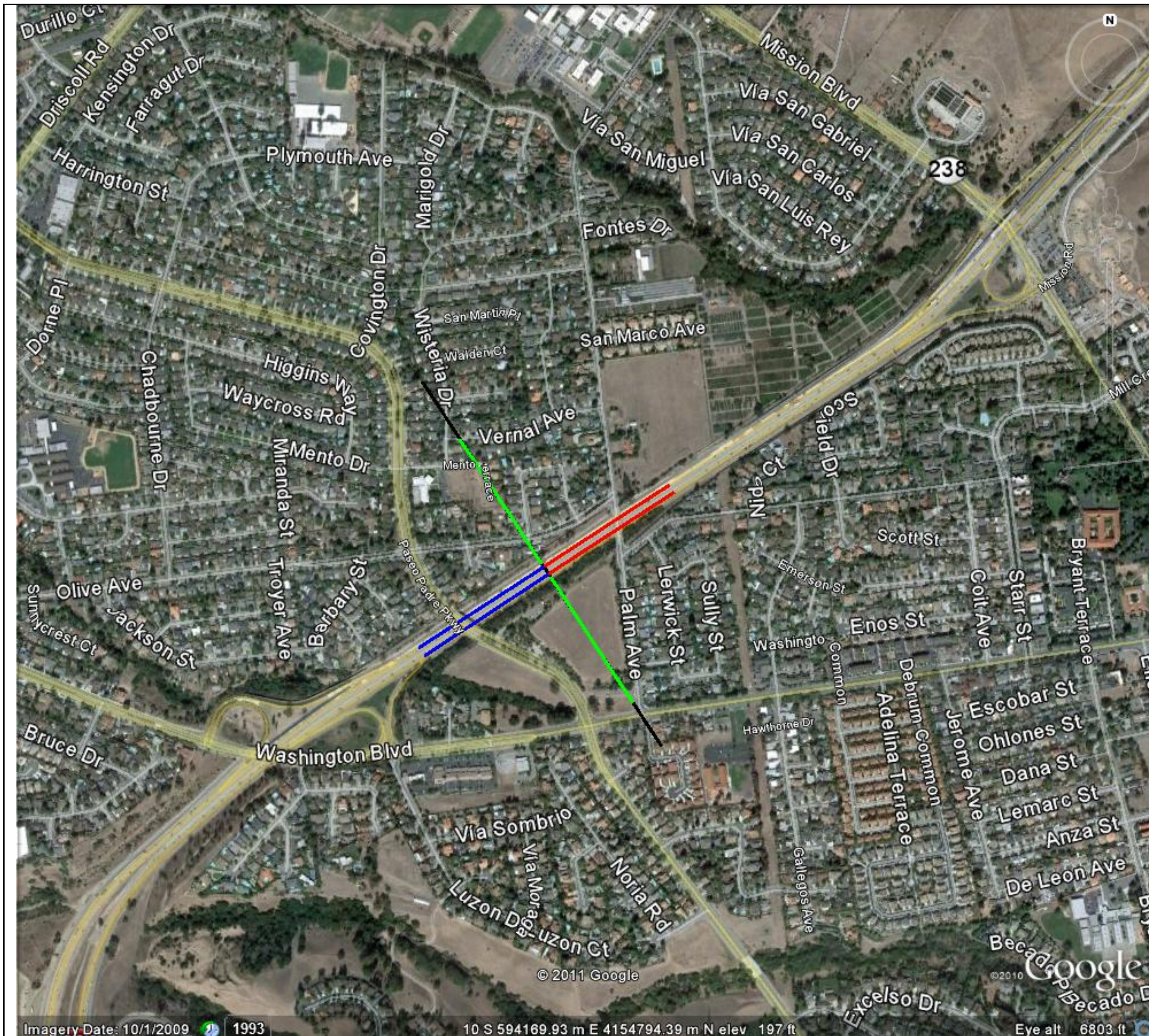
Interstate 680 – North of Auto Mall Pkwy



Weighted Lifetime Cancer Risk (chances in one million)											
Roadway (segment)	**50ft**	**100ft**	**200ft**	**300ft**	**400ft**	**500ft**	**600ft**	**700ft**	**800ft**	**900ft**	**1000ft**
West of I-680	167.5	118.0	73.6	53.5	41.7	33.9	28.3	24.1	20.9	18.3	**16.2**
East of I-680	176.5	124.2	77.3	53.4	39.6	30.5	24.1	19.8	16.4	13.9	**11.9**

Annual $PM_{2.5}$ Concentration ($\mu g/m^3$)											
Roadway (segment)	**50ft**	**100ft**	**200ft**	**300ft**	**400ft**	**500ft**	**600ft**	**700ft**	**800ft**	**900ft**	**1000ft**
West of I-680	0.79	0.55	0.33	**0.24**	0.19	0.15	0.12	0.11	0.09	0.08	0.07
East of I-680	0.94	0.66	0.41	**0.28**	0.21	0.16	0.12	0.10	0.08	0.07	0.06

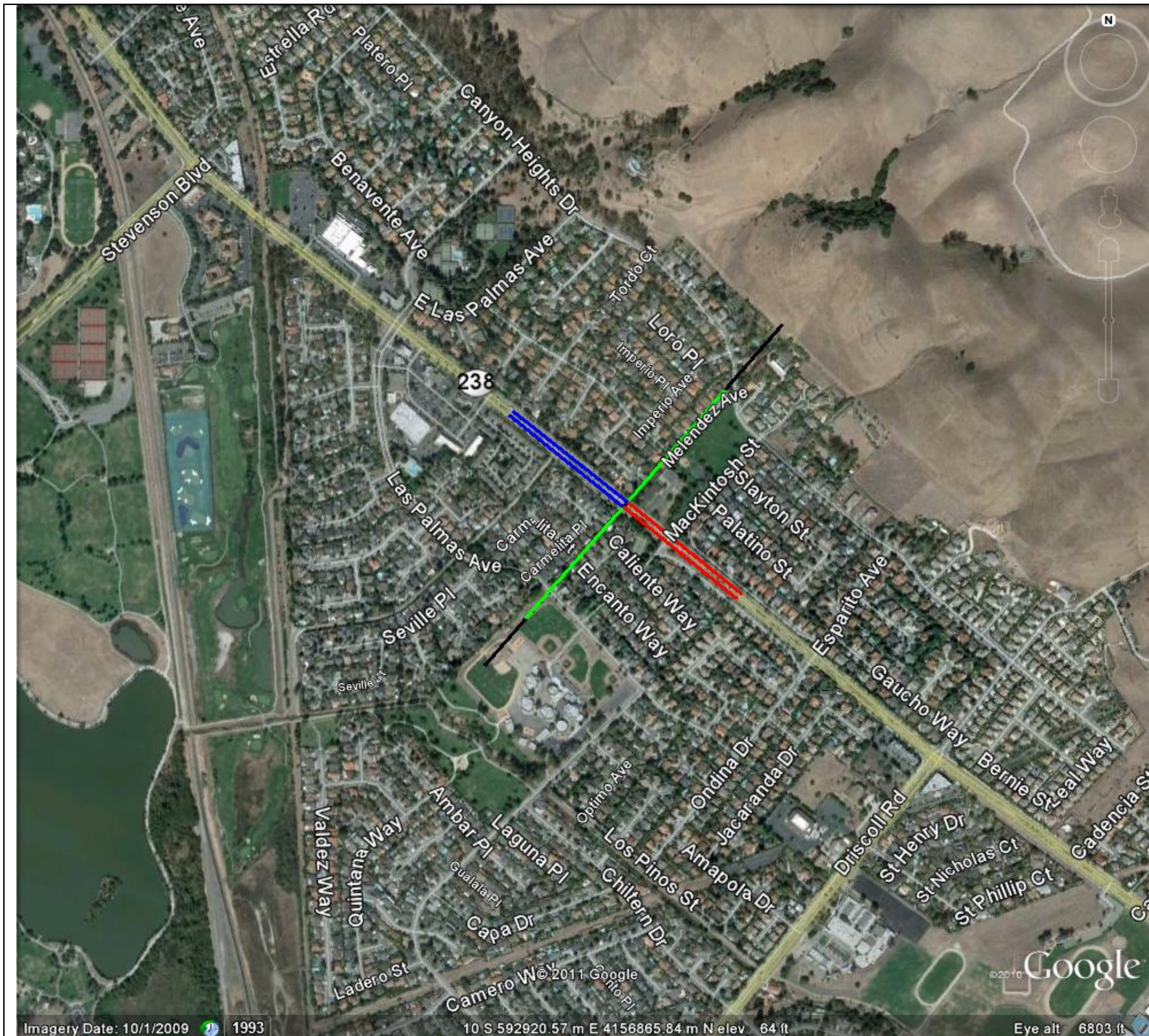
Interstate 680 – Washington Blvd to Mission Blvd



Weighted Lifetime Cancer Risk (chances in one million)											
Roadway (segment)	50ft	100ft	200ft	300ft	400ft	500ft	600ft	700ft	800ft	900ft	1000ft
North of I-680	128.4	63.5	39.2	27.5	21.2	16.4	13.3	11.1	**9.3**	8.2	7.1
South of I-680	175.7	109.6	68.9	49.9	39.4	32.0	26.8	22.8	19.7	17.3	**15.5**

Annual $PM_{2.5}$ Concentration (μg/m^3)											
Roadway (segment)	50ft	100ft	200ft	300ft	400ft	500ft	600ft	700ft	800ft	900ft	1000ft
North of I-680	0.66	0.33	**0.20**	0.14	0.11	0.09	0.07	0.06	0.05	0.04	0.04
South of I-680	0.99	0.62	0.39	**0.29**	0.23	0.19	0.16	0.13	0.12	0.10	0.09

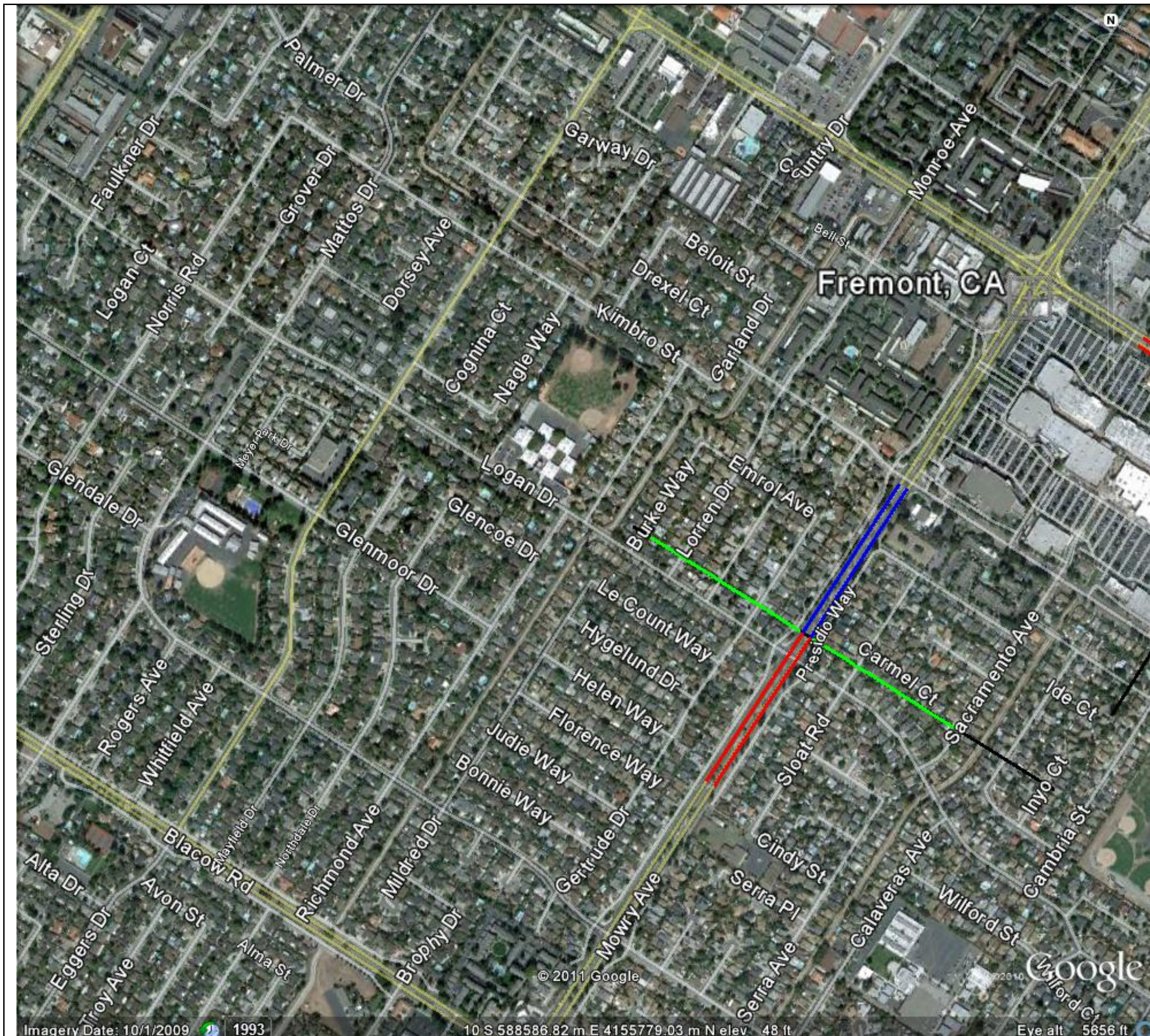
Mission Boulevard – Driscol Rd to Stevenson Rd



Roadway (segment)	50ft	100ft	200ft	300ft	400ft	500ft	600ft	700ft	800ft	900ft	1000ft
	Weighted Lifetime Cancer Risk (chances in one million)										
West of Mission Blvd	10.5	**6.4**	3.7	2.5	1.8	1.4	1.2	1.0	0.8	0.7	0.6
East of Mission Blvd	10.5	**6.7**	3.8	2.5	1.8	1.3	1.0	0.8	0.6	0.5	0.4

Roadway (segment)	50ft	100ft	200ft	300ft	400ft	500ft	600ft	700ft	800ft	900ft	1000ft
	Annual $PM_{2.5}$ Concentration ($\mu g/m^3$)										
West of Mission Blvd	0.08	0.05	0.03	0.02	0.01	0.01	0.01	0.01	0.01	0.00	0.00
East of Mission Blvd	0.09	0.06	0.03	0.02	0.01	0.01	0.01	0.01	0.00	0.00	0.00

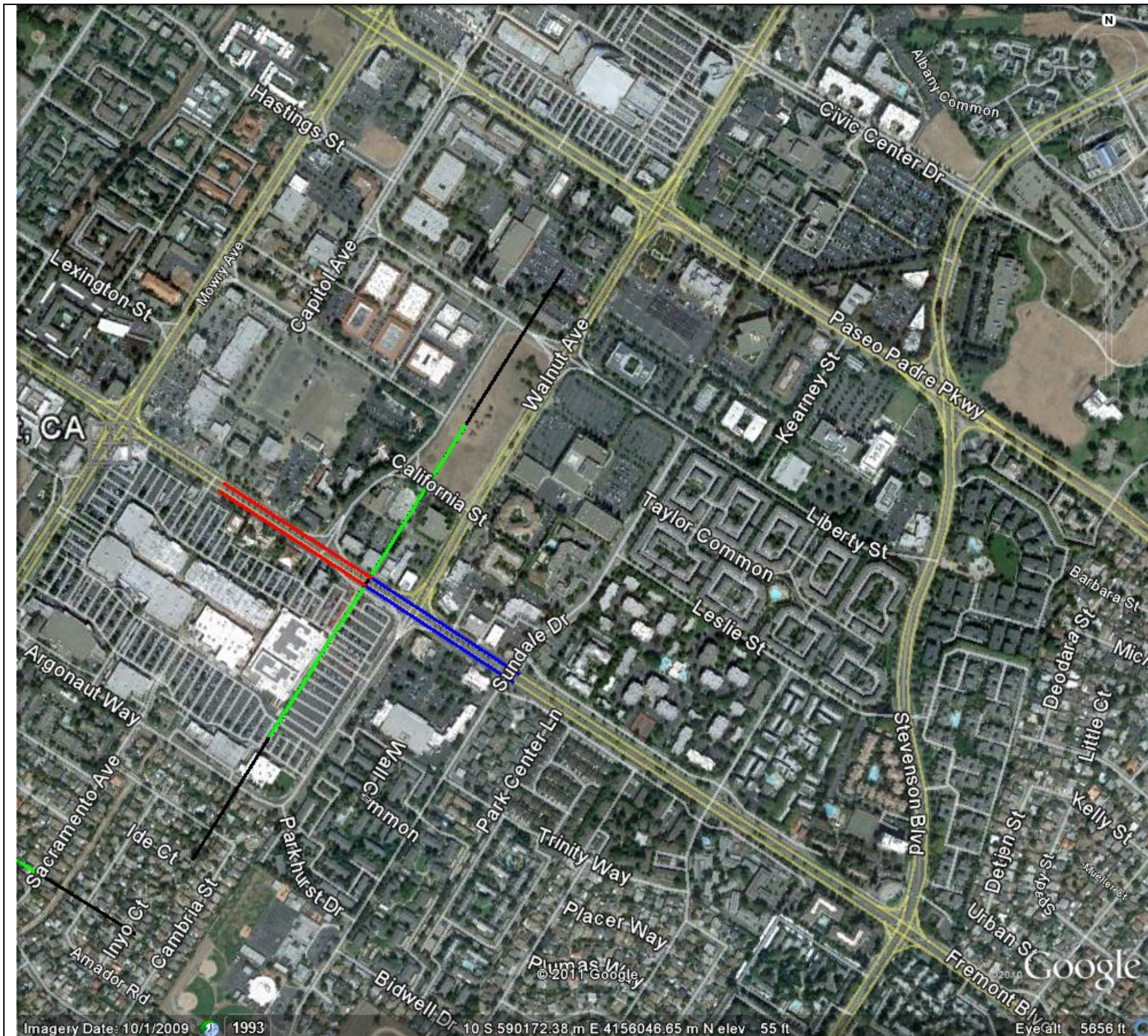
Mowry Avenue – Blacow Rd to Fremont Ave



Weighted Lifetime Cancer Risk (chances in one million)											
Roadway (segment)	**50ft**	**100ft**	**200ft**	**300ft**	**400ft**	**500ft**	**600ft**	**700ft**	**800ft**	**900ft**	**1000ft**
North of Mowry Ave	6.1	4.2	2.6	1.9	1.4	1.1	0.9	0.7	0.6	0.5	0.4
South of Mowry Ave	9.2	6.2	3.9	2.8	2.2	1.8	1.6	1.3	1.2	1.0	0.9

Annual $PM_{2.5}$ Concentration (μg/m^3)											
Roadway (segment)	**50ft**	**100ft**	**200ft**	**300ft**	**400ft**	**500ft**	**600ft**	**700ft**	**800ft**	**900ft**	**1000ft**
North of Mowry Ave	0.10	0.07	0.04	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01
South of Mowry Ave	0.18	0.12	0.07	0.05	0.04	0.04	0.03	0.03	0.02	0.02	0.02

Fremont Ave - Stevenson Rd to Mowry Ave



	Weighted Lifetime Cancer Risk (chances in one million)										
Roadway (segment)	50ft	100ft	200ft	300ft	400ft	500ft	600ft	700ft	800ft	900ft	1000ft
West of Fremont Ave	5.5	3.5	2.0	1.3	1.0	0.7	0.6	0.5	0.4	0.3	0.3
East of Fremont Ave	5.1	3.2	1.8	1.2	0.9	0.6	0.5	0.4	0.3	0.3	0.2

	Annual $PM_{2.5}$ Concentration ($\mu g/m^3$)										
Roadway (segment)	50ft	100ft	200ft	300ft	400ft	500ft	600ft	700ft	800ft	900ft	1000ft
West of Fremont Ave	0.10	0.06	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.00
East of Fremont Ave	0.10	0.06	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.00	0.00

Railroad Community Risk Impacts

Potential health effects from railroad traffic along the Centerville rail line in Fremont were evaluated. This rail line is used by trains for passenger and freight service. Along this rail line, there are up to 14 Capitol Corridor (CC) trains daily, 8 Altamont Commuter Express (ACE) trains per weekday, and about 8 daily freight trains[7]. For this analysis it was assumed that up to 30 diesel trains would pass through this segment daily.

The analysis is meant to show screening level community risk in Fremont along this rail line. The volume of train activity, operating characteristics, and rail line orientation has a considerable effect on the level of community risk. Three portions of the rail line were evaluated to reflect the different orientation of the rail line and the changes in train speed.

- Segment 1 is a portion of the rail line that is south of the Peralta Station and north of I-880. Trains along this segment were assumed to operate at speeds of about 45 mph.

- Segment 2 is the portion of the rail line just south of the Peralta Stations where trains are assumed to operate at slower speeds (about 25 mph) due to at grade crossings. As a result, emissions and resulting concentrations are higher.

- Segment 3 is a portion of the rail line north of Peralta Station where trains are assumed to operate at a bout 45 mph.

<u>Railroad Emissions Modeling</u>

DPM and $PM_{2.5}$ emissions from trains on the Centerville rail line were calculated using EPA emission factors for locomotives[8] and CARB adjustment factors to account for fuels used in California[9]. Diesel locomotive engines for the CC and ACE passenger trains range from 3,000 to 3,200 horsepower and are, on average, currently using Tier 0 or better engines. By 2020 it is expected that most locomotive engines will either be replaced or remanufactured to meet EPA's Tier 2+ or Tier 3 emission standards. Emissions from the trains on the Centerville were assumed to be traveling at about 45 mph with the engines operating at about 75% load and have 3,200 horsepower engines. The exception is the segment of track just south of the Peralta Station where trains were assumed to operate at 25 mph as the traveled through at-grade gated crossings. Emissions were calculated for years 2010 and 2020, so the effect of lower emissions beyond 2020 was not considered for cancer risk computations (i.e. Tier 4 engines which would lower emissions by another 80 percent).

<u>Rail Line Dispersion Modeling</u>

Dispersion modeling of locomotive emissions was conducted using the EPA's ISCST3 dispersion model and hourly meteorological data from the Fremont monitoring station (for years 1990-94). Locomotive emissions were modeled as a line source (series of volume sources) along

7 *Bay Area Regional Rail Plan, Technical Memorandum 4a, Conditions, Configuration & Traffic on Existing System*, Metropolitan Transportation Commission, November 15, 2006.
8 *Emission Factors for Locomotives*, USEPA 2009 (EPA-420-F-09-025)
9 *Offroad Modeling, Change Technical Memo*, Changes to the Locomotive Inventory, CARB July 2006.

the rail line over a 2,000 foot segment of track. A volume source release height of 18 feet was used in the modeling.

Receptors were placed normal to the track at the center of the link at 50-, 100-, 200-, 300-, 400-, and 500-foot distances from the track. The receptor heights were set at 5 feet (or 1.5 meters).

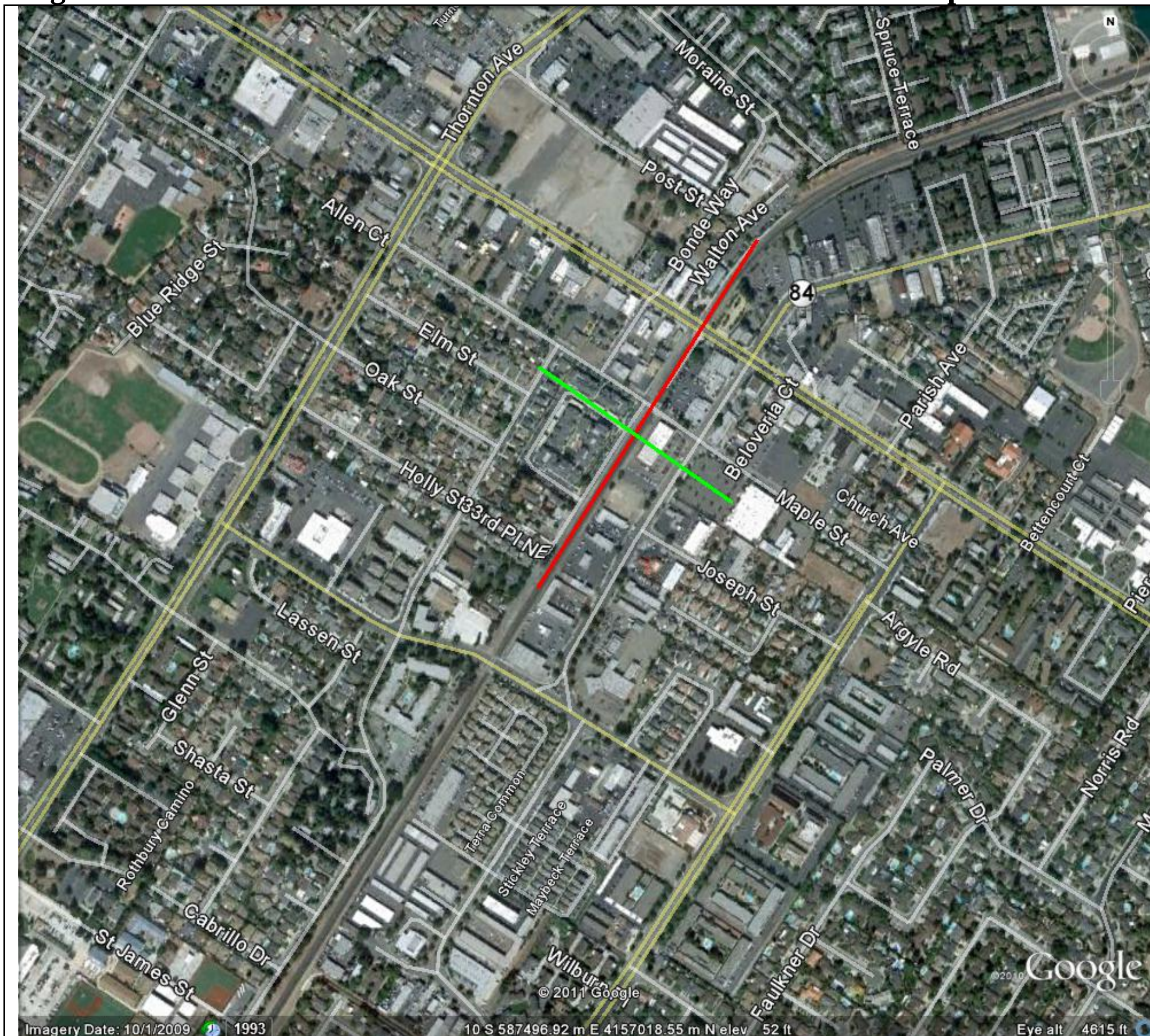
Segment 1: Centerville Rail Line South of the Peralta Station near (I-880) – 45 mph

Weighted Lifetime Cancer Risk (chances in one million)

Roadway (segment)	50ft	100ft	200ft	300ft	400ft	500ft			
East of rail line	13.5	11.3	8.3	6.4	5.2	4.3	Distance to 10 in 1 million:	145 ft	
West of rail line	12.0	9.8	6.9	5.1	4.0	3.2	Distance to 10 in 1 million:	100 ft	

Roadway (segment)	50ft	100ft	200ft	300ft	400ft	500ft	600ft	700ft	800ft	900ft	1000ft
East of rail line	0.02	0.02	0.02	0.01	0.01	0.01					
West of rail line	0.02	0.02	0.01	0.01	0.01	0.01					

Segment 2: Centerville Rail Line South of the Peralta Station – 25 mph

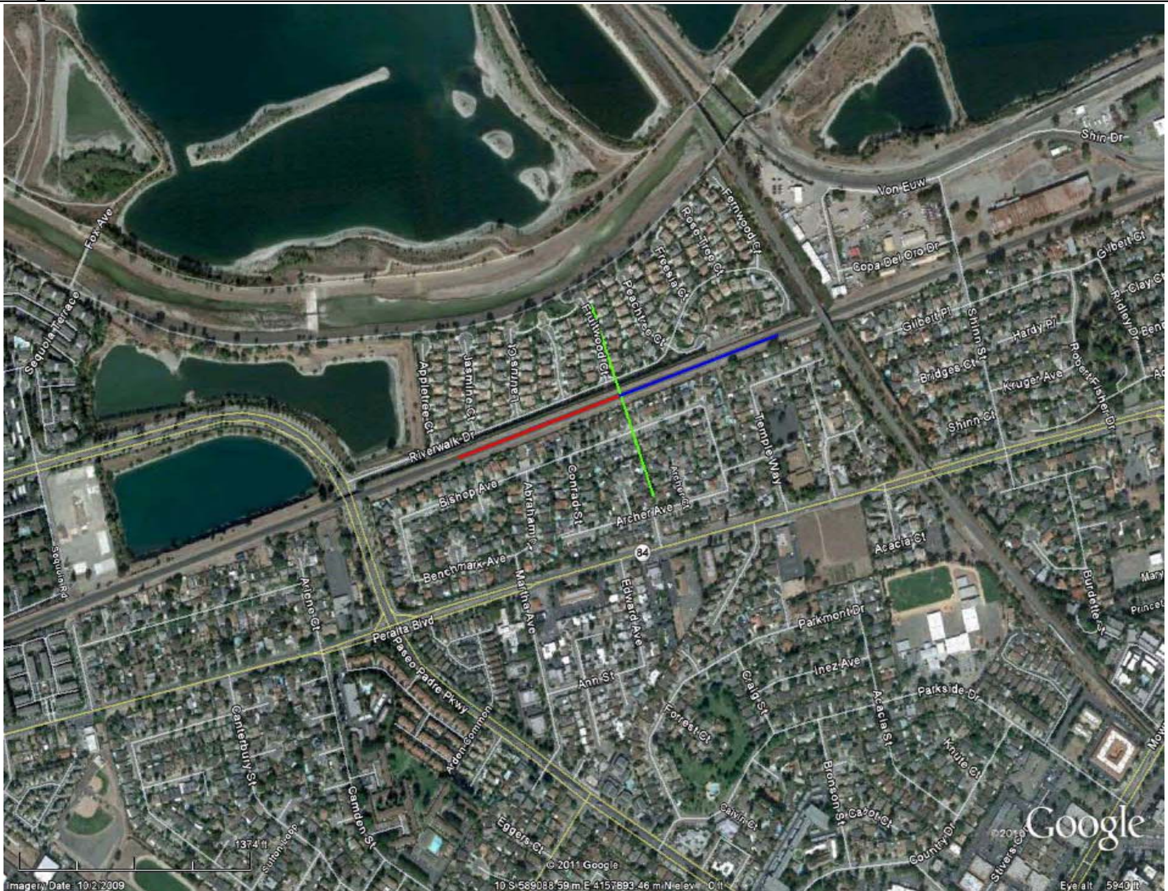


Weighted Lifetime Cancer Risk (chances in one million)

Roadway (segment)	50ft	100ft	200ft	300ft	400ft	500ft			
East of rail line	24.3	20.4	14.9	11.5	9.3	7.8	Distance to 10 in 1 million:	350 ft	
West of rail line	21.6	17.7	12.5	9.3	7.2	5.7	Distance to 10 in 1 million:	280 ft	

Roadway (segment)	50ft	100ft	200ft	300ft	400ft	500ft	600ft	700ft	800ft	900ft	1000ft
East of rail line	0.04	0.04	0.03	0.02	0.02	0.01					
West of rail line	0.04	0.03	0.02	0.02	0.01	0.01					

Segment 3: Centerville Rail Line North of the Peralta Station)



Weighted Lifetime Cancer Risk (chances in one million)											
Roadway (segment)	**50ft**	**100ft**	**200ft**	**300ft**	**400ft**	**500ft**	**600ft**	**700ft**	**800ft**	**900ft**	**1000ft**
East of rail line	17.9	14.2	9.8	7.2	5.5	4.4	Distance to 10 in 1 million:			200 ft	
West of rail line	10.0	7.6	4.9	3.5	2.7	2.1	Distance to 10 in 1 million:			50 ft	

Roadway (segment)	**50ft**	**100ft**	**200ft**	**300ft**	**400ft**	**500ft**	**600ft**	**700ft**	**800ft**	**900ft**	**1000ft**
East of rail line	0.03	0.03	0.02	0.01	0.01	0.01					
West of rail line	0.02	0.01	0.01	0.01	0.00	0.00					

EPA Locomotive Engine Emission Standards

The U.S. EPA establishes locomotive engine standards throughout the Untied States, including California. CARB established fuel standards in California, which unlike most other parts of the country require ultra-low sulfur diesel for off-road vehicles. In 1998, EPA adopted Tier 0 (engine model years 1973-2001), Tier 1 (engine model years 2002-2004), and Tier 2 (engine model years 2005+) emissions standards applicable to newly manufactured and remanufactured railroad locomotives and locomotive engines. These standards required compliance with progressively more stringent standards for emissions of hydrocarbon (HC), CO, NOx, and DPM. In 2008, EPA adopted additional standards for locomotive diesel engines that will further reduce emissions of DPM and NOx from locomotives. The standards were designed to:

1. Tighten emissions standards for existing locomotives diesel engines when they are remanufactured;

2. Set near-term engine-out emissions standards, referred to as Tier 3 standards, for newly-built locomotive engines; and
3. Set longer-term standards, referred to as Tier 4 standards, for newly-built locomotives and marine diesel engines that reflect the application of high-efficiency aftertreatment technology.

The 2008 standards set more stringent emission standards for remanufactured Tier 0 – Tier 2 locomotives than the original 1998 regulations. In addition it added Tier 3 standards for new and remanufactured engines starting in 2009 and Tier 4 standards for new and remanufactured engines beginning in 2015. The EPA estimates 90 percent reduction in DPM emissions from Tier 4 engines compared to engines meeting the current Tier 2 standards.

Stationary and Area Source Community Risk Impacts

Stationary sources are sources of air pollution that are permitted by BAAQMD. These mostly include emergency generators powered by diesel engines, gasoline stations, dry cleaners, and auto body shops that have spray painting facilities. These types of sources have mostly localized impacts. There are larger stationary sources permitted by BAAQMD that can have greater impacts, but these are not as common. Typical large sources include power plants, chemical plants, refineries, manufacturing facilities and certain types of landfills.

Stationary sources are required to obtain permits from BAAQMD. Permit conditions typically require a certain amount of air pollution control and may limit the operations of a source. In the case of diesel-powered generators, there are limits on the emissions and amount of time per year that a generator can be operated for testing or maintenance. BAAQMD's Toxics New Source Review (Regulation 2, Rule 5) requires projects that may pose a risk to apply Toxics Best Available Control Technology (T-BACT) and not cause an unacceptable cancer risk (10 excess cancers per million people) or cause a hazard (chronic or acute non-cancer risk). Typically, BAAQMD conducts or requires applicants to prepare health risk assessments for stationary sources that pose a potential impact.

The City of Fremont has numerous permitted stationary sources. These sources are located throughout the City, but mostly in industrial and commercial areas. The impact of these sources can only be addressed on a project-by-project basis, since impacts are generally localized. To assist lead agencies, BAAQMD has provided a database of permitted sources for each County. The database is contained in a Google Earth tool that allows a user to identify stationary sources within 1,000 feet of a receptor. The database can then be accessed through Google Earth to determine conservative screening levels of cancer risk, hazards and $PM_{2.5}$ concentrations. This allows many of the sources to be screened out of any additional analysis. Stationary sources that show the potential for significant community risk impacts after this first level of review are further analyzed by contacting BAAQMD for additional information and applying distance adjustment factors. A refined modeling analysis would be required if there are sources that still have potentially significant impacts after this level of review. A refined analysis would include dispersion modeling of the source using emissions and source information provided by BAAQMD. If the source still has significant community risk impacts following this level of effort, then risk reduction strategies would have to be implemented by the project on a case-by-case basis.

In Fremont, the most common stationary sources would include gasoline stations, dry cleaning facilities, and standby emergency generators powered by diesel engines. These sources are anticipated to have localized impacts, but since sensitive receptors could be located near these sources or the sources could be located near sensitive receptors, potential impacts may occur. The potential impact of siting each of these sources near sensitive receptors is described below:

Gasoline Stations

Benzene, a potent carcinogen, is released into the air during motor vehicle refueling. Most benzene is emitted from motor vehicle and motor vehicle related activity. Gasoline-dispensing stations can have high-localized emissions. Due to increased vapor recovery systems and reformulated fuels, benzene emissions have been reduced substantially since 1990. Some gasoline dispensing stations are located in areas close to residential areas, which may result in elevated health risks in the local proximity. Well maintained vapor recovery systems, which are required in the Bay Area, can decrease benzene emissions by over 90%. CARB reported that almost all gasoline dispensing stations in California had an annual throughput of 2.4 million gallons per year or less. The highest 4% had an average annual throughout of 3.6 million gallons per year. These were very large gasoline dispensing stations. CARB found the cancer risks associated with these relatively high volume stations to be about 10 in one million at a distance of 50 feet.

Dry Cleaning Facilities

Perchlorethylene (Perc) is the solvent used commonly in past dry cleaning operations. Perc is a TAC, because it has the potential to cause cancer. Other non-cancer health effects can occur at higher exposures. Dry cleaning operations are typically located in urban areas and can be in close proximity to residences or other sensitive receptors. Some of these operations may occur in the same buildings that have residential occupants. CARB has found a wide range of exposures from these facilities that are correlated with the condition of the operations and volume of solvent used. Most dry cleaning operations in California have one dry cleaning machine per facility. Some larger facilities may have two machines. Based past studies, CARB recommended a buffer of 300 feet between new sensitive land uses and any dry cleaning operation (i.e., a facility that conducts dry cleaning using Perc on site)10. An increased buffer of 500 feet was recommended for any facility that has two machines.

As a result of identifying Perc as a TAC, CARB developed an ATCM addressing Perc emissions from dry cleaning operations in 1993. In 2007, CARB approved amendments to the Dry Cleaning ATCM and the adoption of requirements for Perc manufacturers and distributors to further reduce Perc emissions. The amendments will over time phase out the use of Perc dry cleaning machines and related equipment by 2023. The sale or lease of any new Perc dry cleaning equipment was unlawful beginning in 2008. Beginning July 2010, all Perc machines at buildings co-located with residences must be removed and any machine over 15 years of age cannot be operated. The anticipated exposures from Perc will be reduced significantly as a result of the new ATCM amendments that affect dry cleaning operations. Cancer risks, which CARB based their recommended buffers, are computed over a 70-year almost continuous exposure.

10 CARB. 2005. Air Quality and Land Use Handbook: A Community Health Perspective. April.

The Perc exposures would be reduced by 80% or more as a result of the new ACTM amendments. As a result, siting of new sensitive receptors could be allowed within 100 feet of these operations. It should be noted that many dry cleaners contract to have the cleaning done off site.

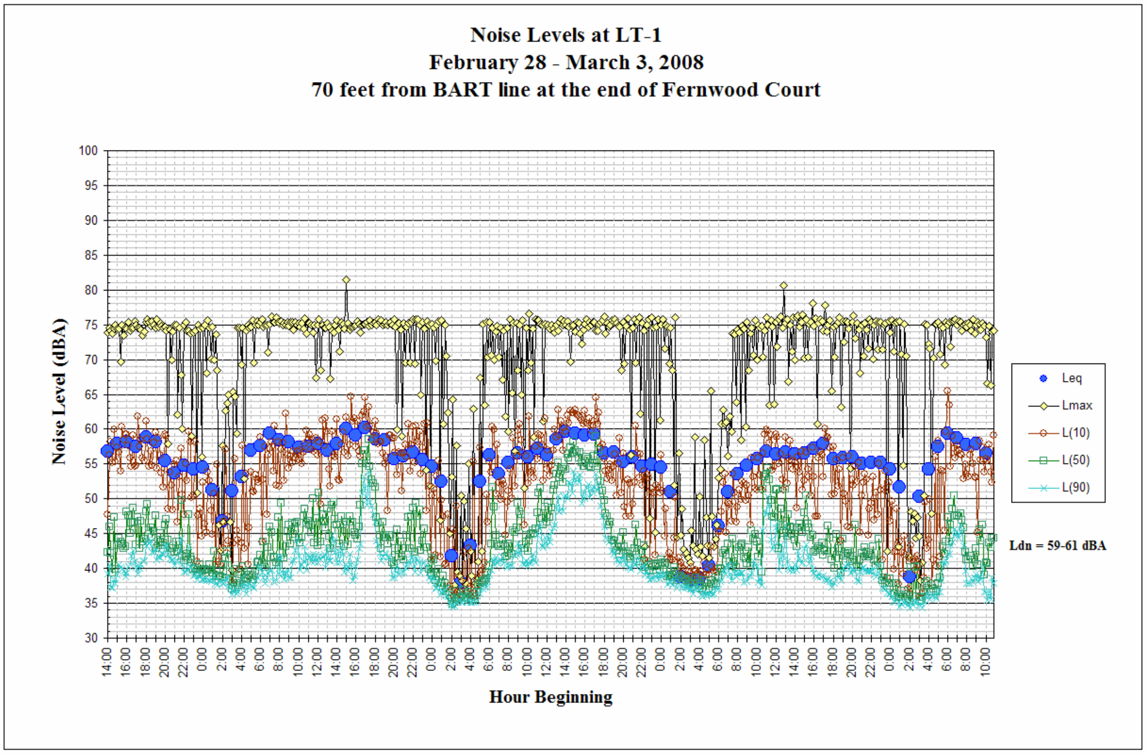
Emergency Back-Up Generators

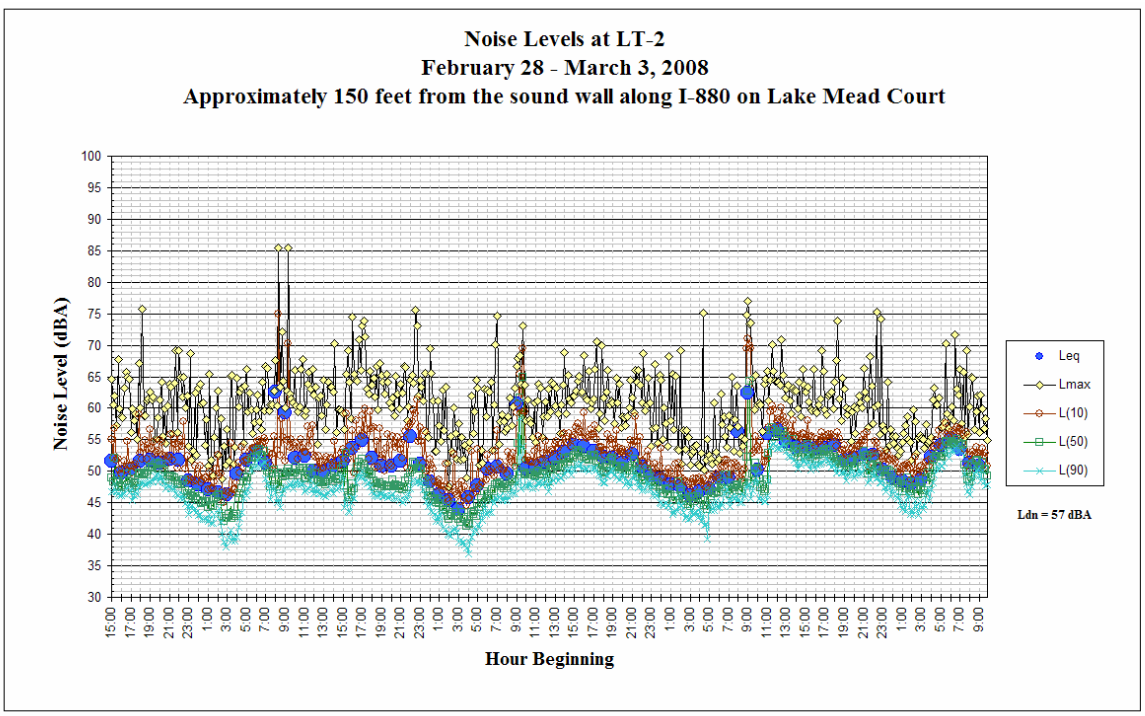
Electricity generators that are powered by diesel engines are common. They are typically located at facilities where uninterrupted electricity is necessary. Common facilities include fire and police stations, hospital or medical treatment facilities, pump stations, schools, offices and data centers. Diesel engines powering these generators are regulated by BAAQMD and CARB. CARB has established strict emissions limits and operating restrictions for engines larger than 50 horsepower. BAAQMD has developed criteria (Regulation 2 Rule 5) for approval of projects with new or modified emission sources of TACs. These criteria are based on health risk and use of T-BACT. BAAQMD has determined that projects with a cancer risk of less than 10 in a million are acceptable. Additionally, T-BACT is triggered for diesel engines that are over 50 horsepower. As a result, all new engines have very localized impacts and would not be permitted if they would cause significant cancer risks or hazards. Existing engines are only permitted to operate for 50 hours per years for maintenance or routine testing.

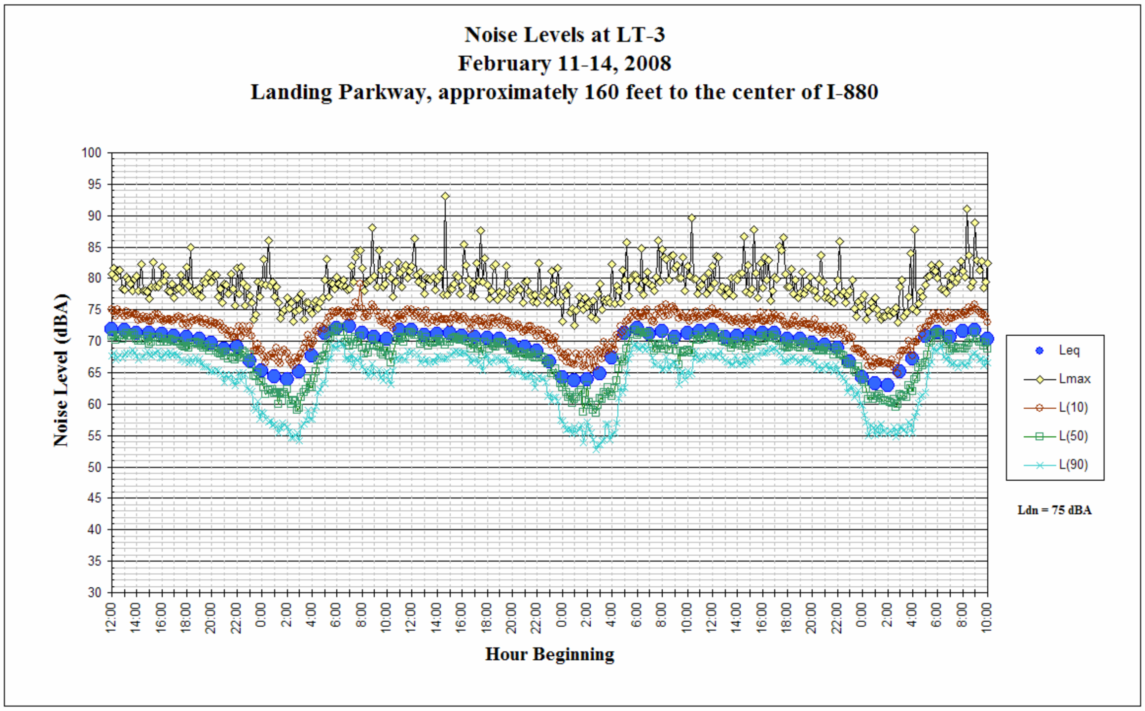
APPENDIX D

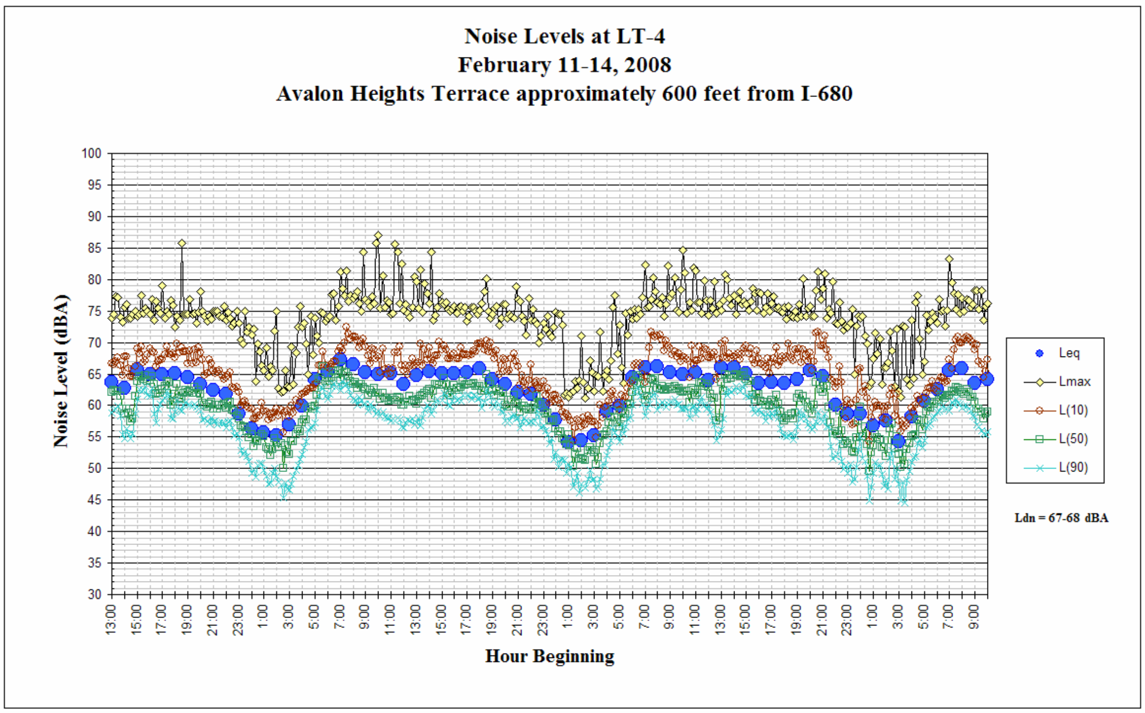
Nose Measurements

Appendix

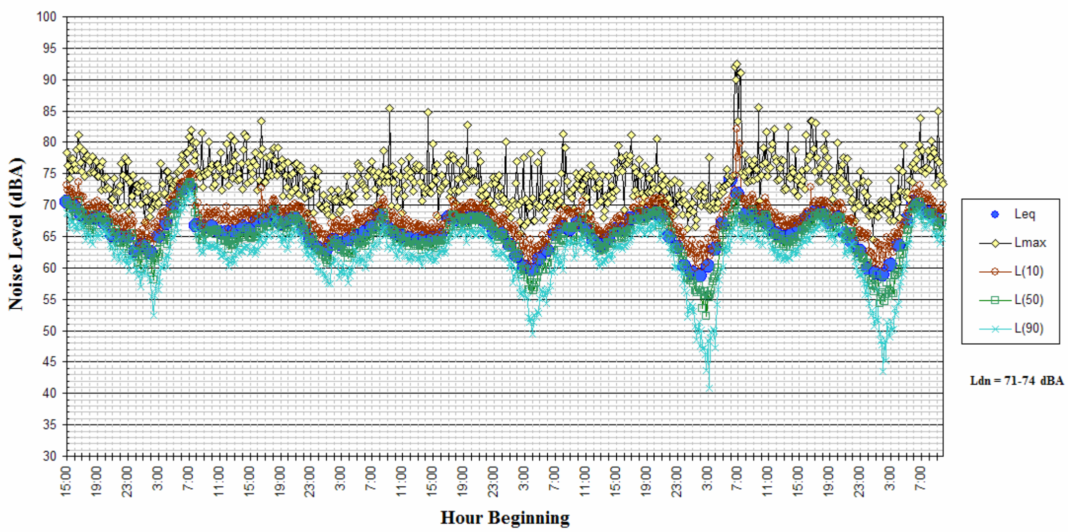

Noise Levels at LT-1
February 28 - March 3, 2008
70 feet from BART line at the end of Fernwood Court
Noise Level (dBA)
Hour Beginning
Leq
Lmax
L(10)
L(50)
L(90)
Ldn = 59-61 dBA


Noise Levels at LT-2
February 28 - March 3, 2008
Approximately 150 feet from the sound wall along I-880 on Lake Mead Court
Noise Level (dBA)
Hour Beginning
Leq
Lmax
L(10)
L(50)
L(90)
Ldn = 57 dBA

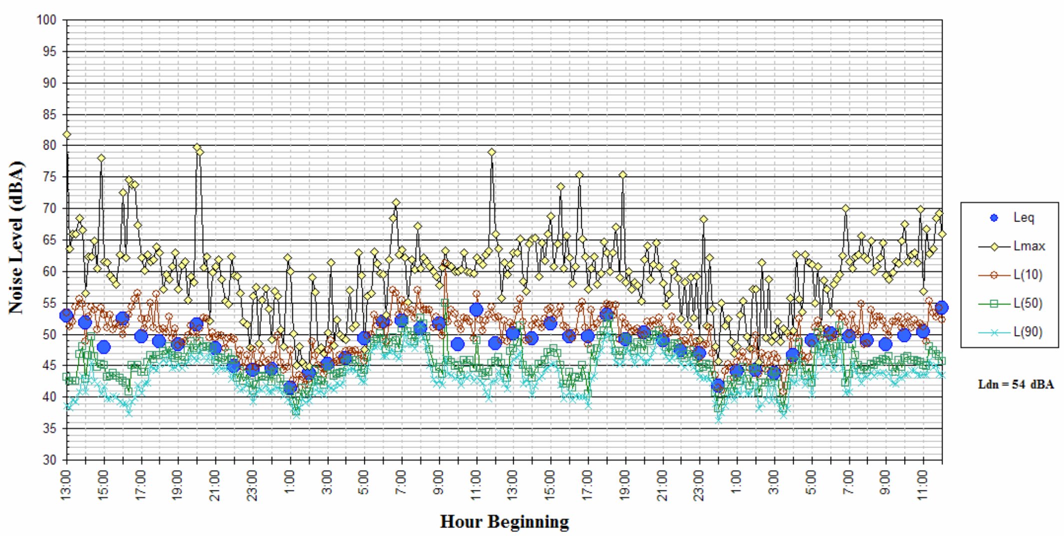

Noise Levels at LT-3
February 11-14, 2008
Landing Parkway, approximately 160 feet to the center of I-880
Noise Level (dBA)
Hour Beginning
Leq
Lmax
L(10)
L(50)
L(90)
Ldn = 75 dBA

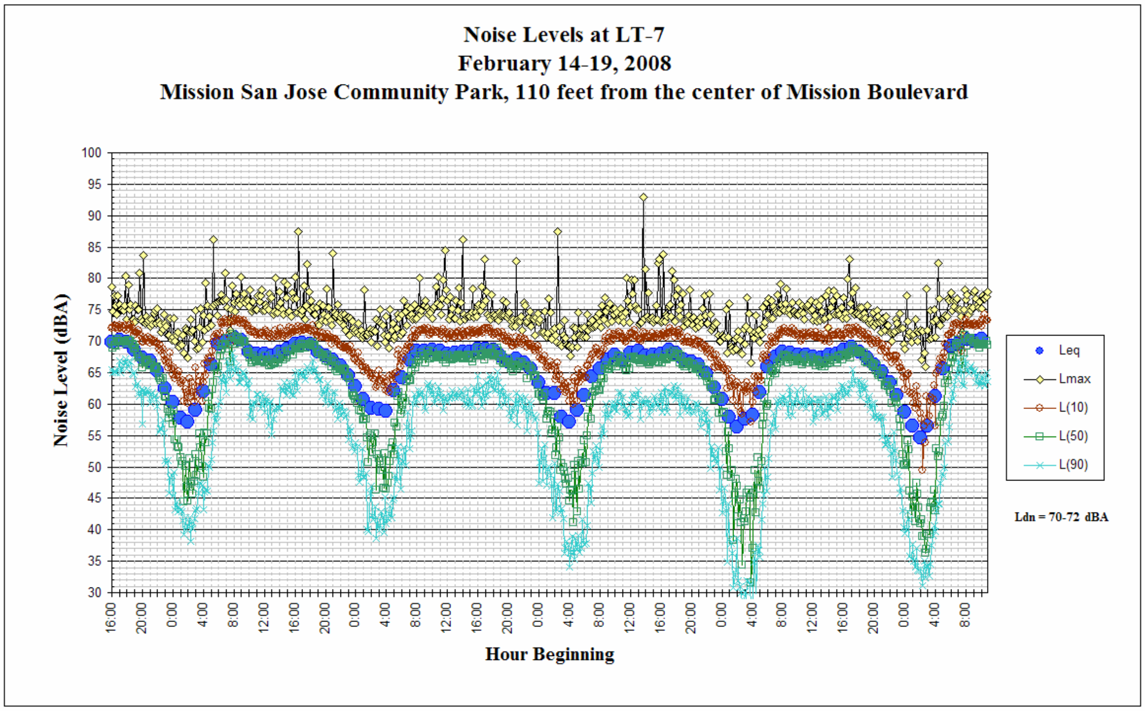

Noise Levels at LT-4
February 11-14, 2008
Avalon Heights Terrace approximately 600 feet from I-680
Noise Level (dBA)
Hour Beginning
Leq
Lmax
L(10)
L(50)
L(90)
Ldn = 67-68 dBA

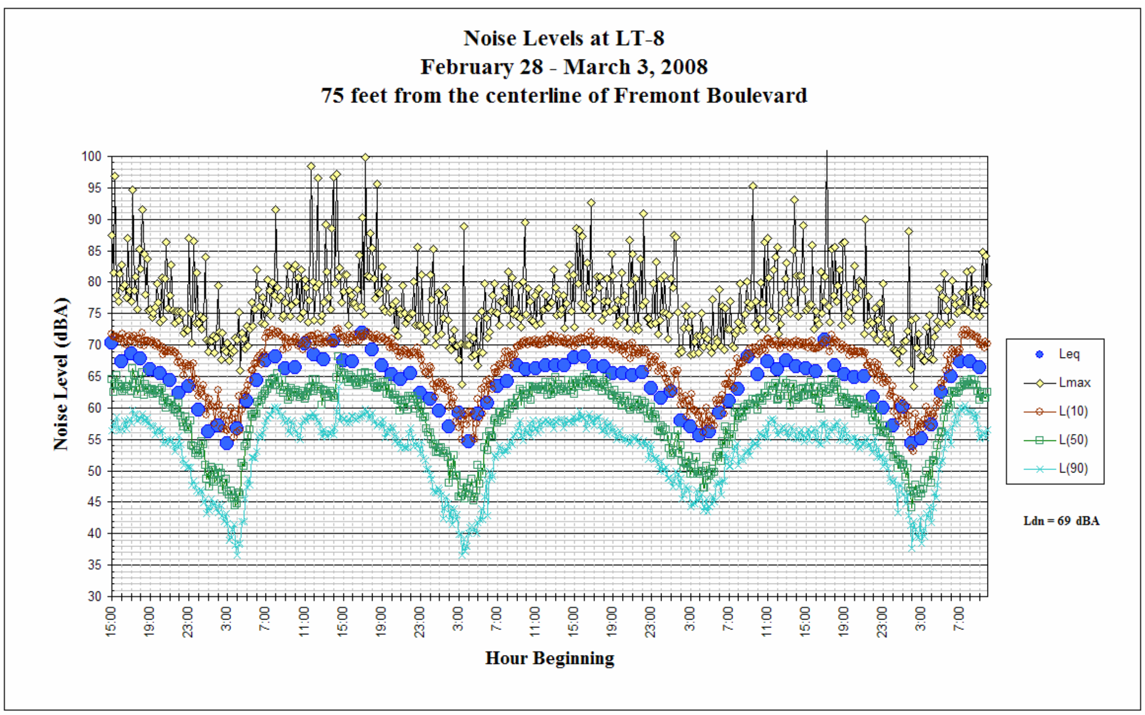
Noise Levels at LT-5
February 14-19, 2008
Research Park Avenue approximately 130 feet to the edge of I-680

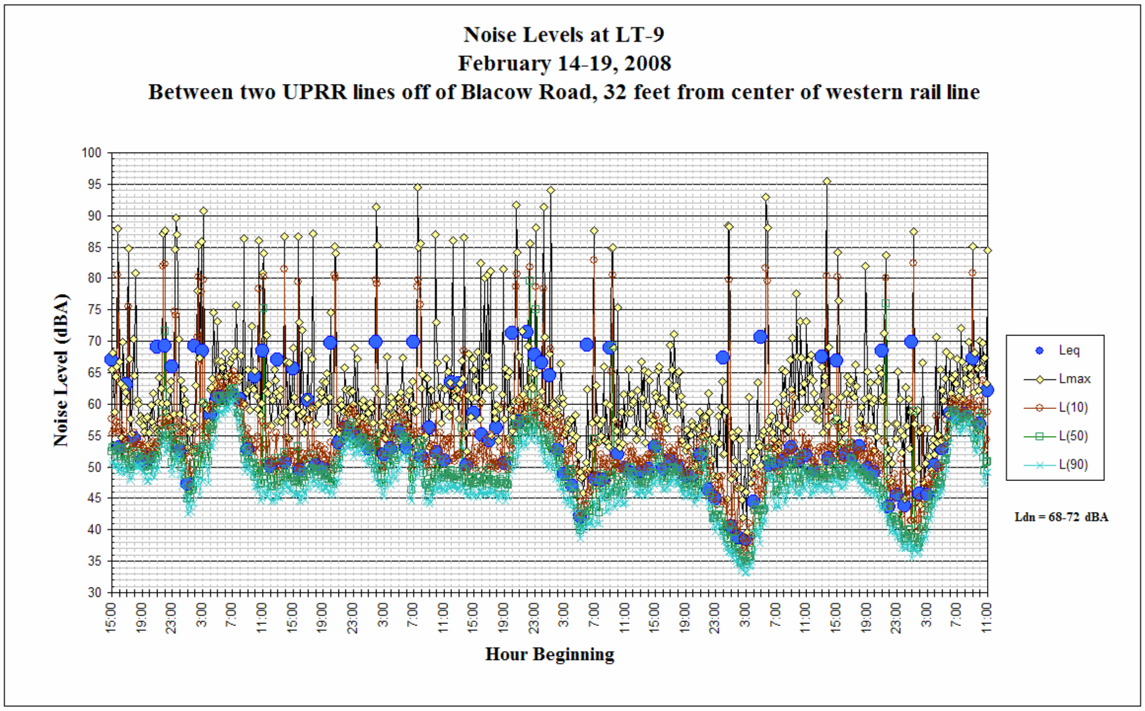


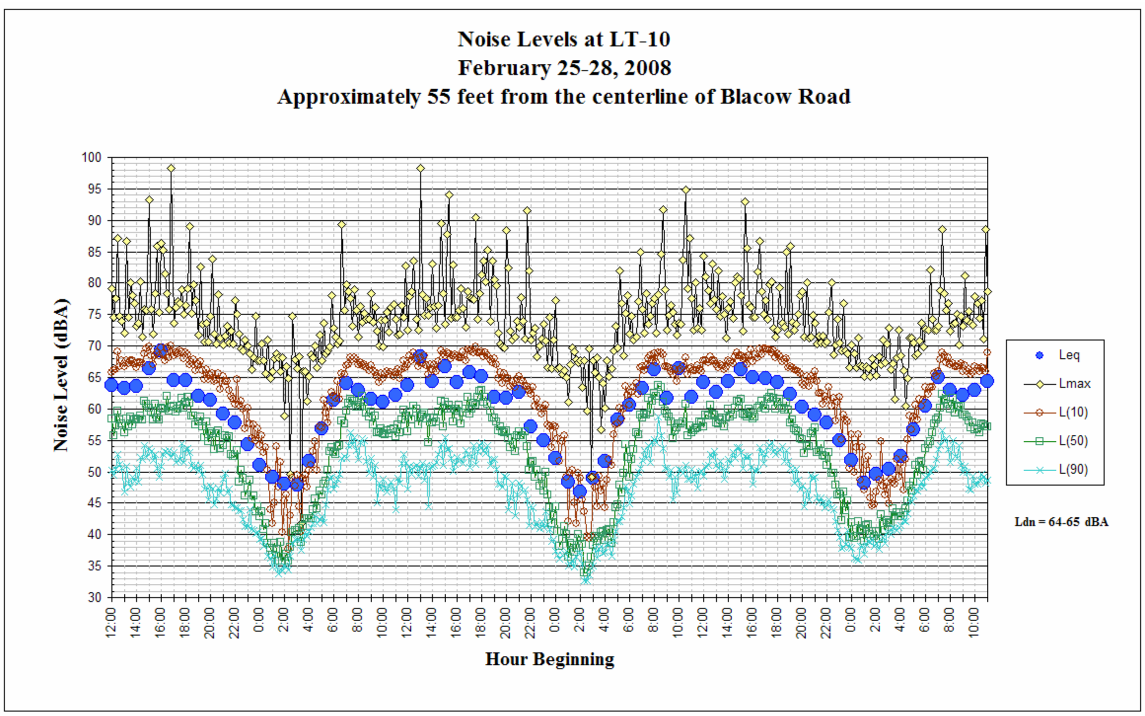
Noise Levels at LT-6
February 11-14, 2008
Vineyard Avenue near parking lot for Mission Peak Park

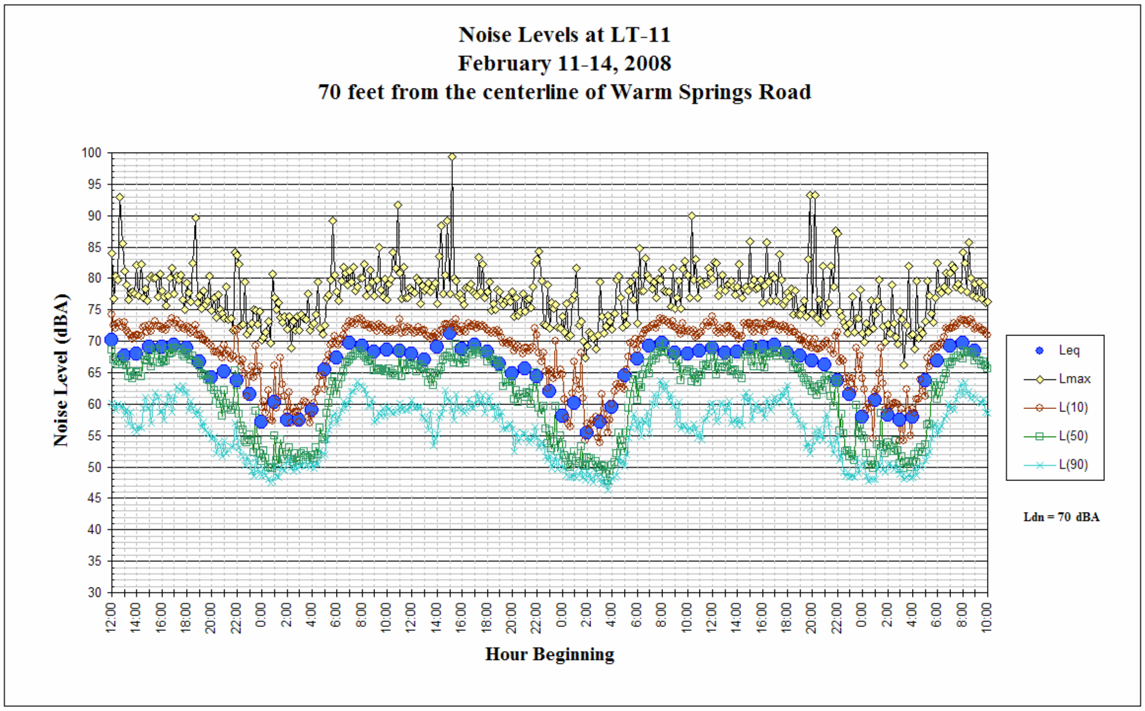


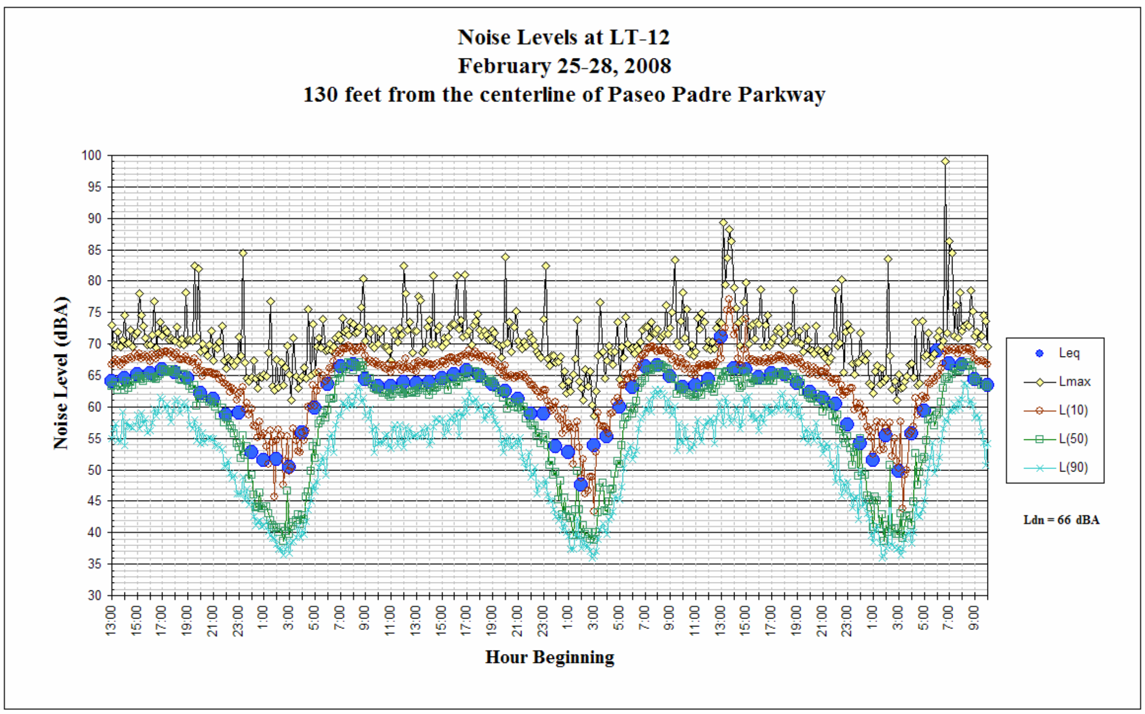

Noise Levels at LT-7
February 14-19, 2008
Mission San Jose Community Park, 110 feet from the center of Mission Boulevard
Noise Level (dBA)
Hour Beginning
Leq
Lmax
L(10)
L(50)
L(90)
Ldn = 70-72 dBA


Noise Levels at LT-8
February 28 - March 3, 2008
75 feet from the centerline of Fremont Boulevard
Noise Level (dBA)
Hour Beginning
Leq
Lmax
L(10)
L(50)
L(90)
Ldn = 69 dBA

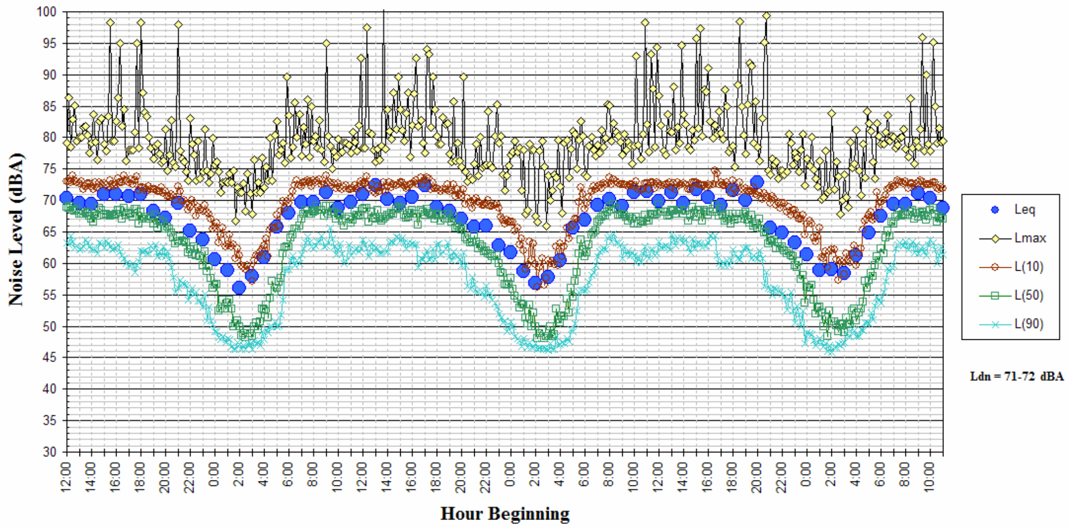

Noise Levels at LT-9
February 14-19, 2008
Between two UPRR lines off of Blacow Road, 32 feet from center of western rail line
Noise Level (dBA)
Hour Beginning
Leq
Lmax
L(10)
L(50)
L(90)
Ldn = 68-72 dBA


Noise Levels at LT-10
February 25-28, 2008
Approximately 55 feet from the centerline of Blacow Road
Noise Level (dBA)
Hour Beginning
Leq
Lmax
L(10)
L(50)
L(90)
Ldn = 64-65 dBA

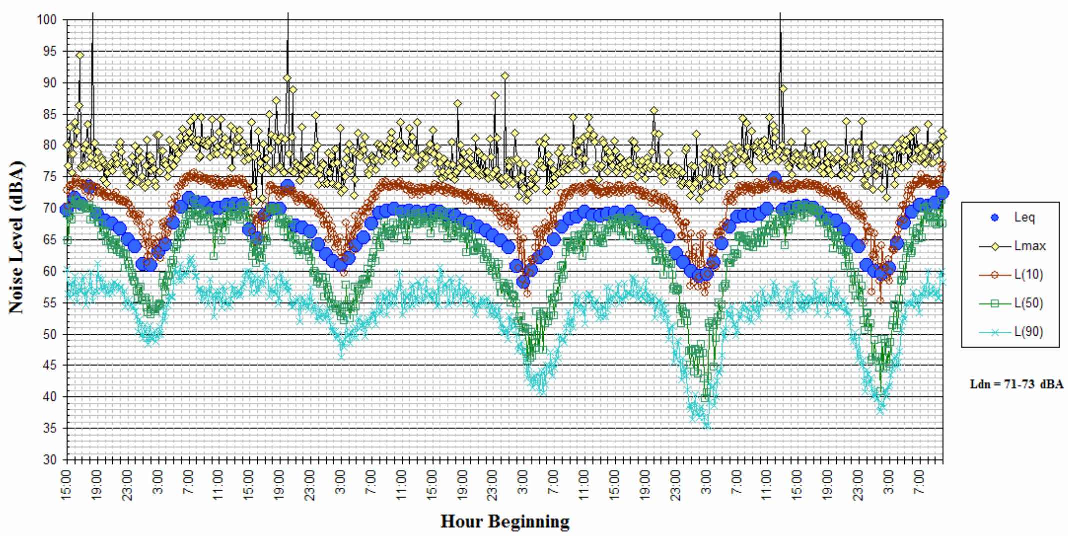

Noise Levels at LT-11
February 11-14, 2008
70 feet from the centerline of Warm Springs Road
Noise Level (dBA)
Hour Beginning
Leq
Lmax
L(10)
L(50)
L(90)
Ldn = 70 dBA


Noise Levels at LT-12
February 25-28, 2008
130 feet from the centerline of Paseo Padre Parkway
Noise Level (dBA)
Hour Beginning
Leq
Lmax
L(10)
L(50)
L(90)
Ldn = 66 dBA

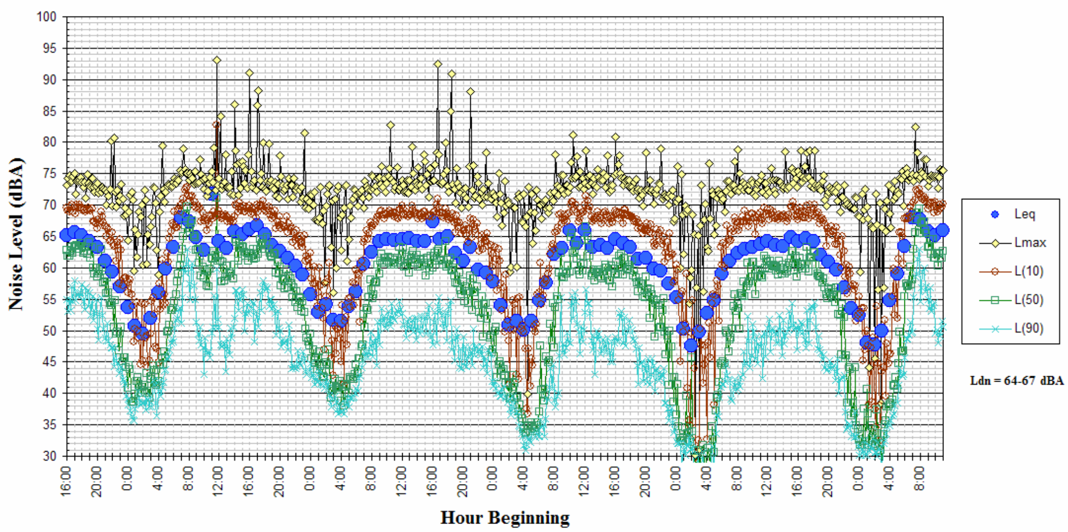
Noise Levels at LT-13
February 25-28, 2008
Approximately 80 feet from the centerline of Mowry Avenue



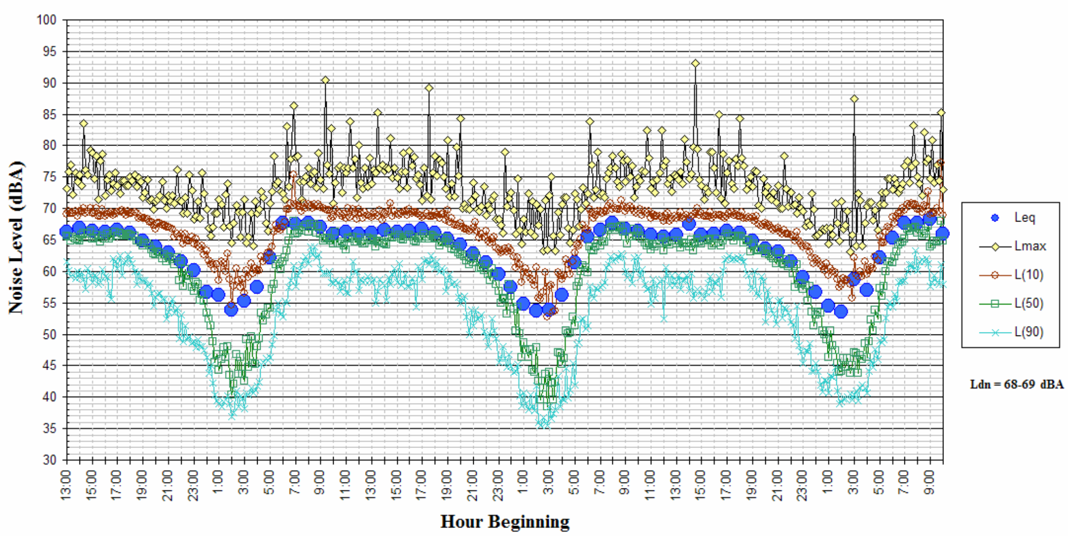
Noise Levels at LT-14
February 14-19, 2008
Approximately 100 feet from the centerline of Auto Mall Parkway

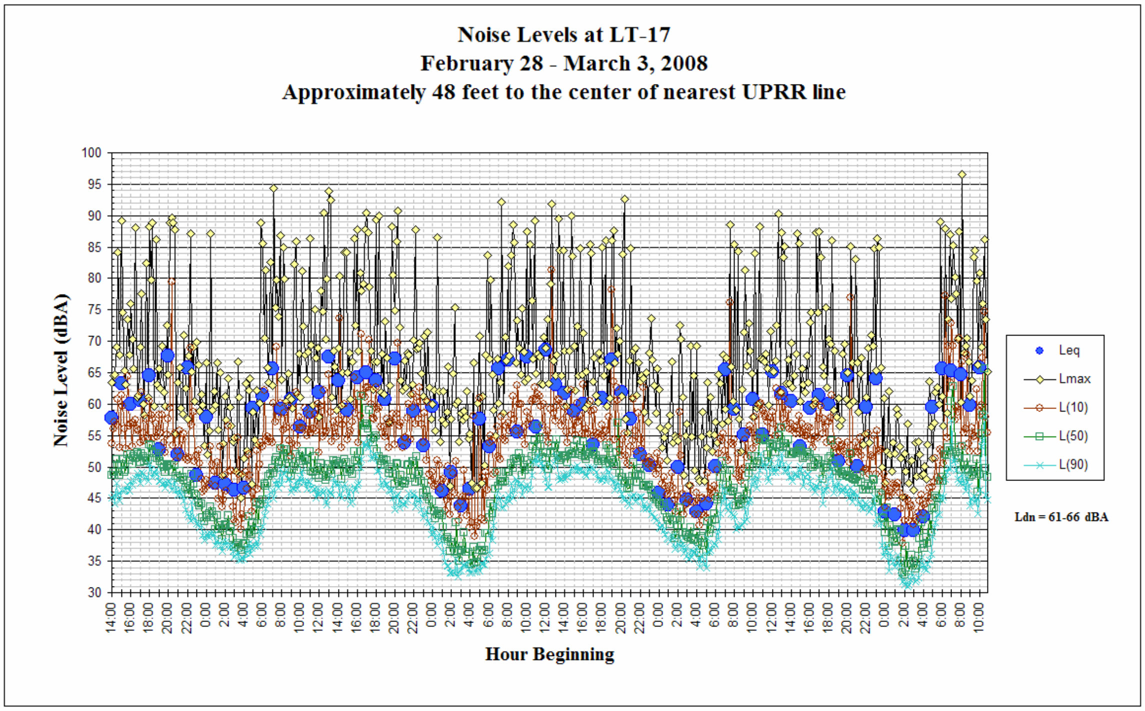


Noise Levels at LT-15
February 14-19, 2008
Approximately 90 feet from the centerline of Driscoll Road



Noise Levels at LT-16
February 25-28, 2008
80 feet to the centerline of Stevenson Boulevard




Noise Levels at LT-17
February 28 - March 3, 2008
Approximately 48 feet to the center of nearest UPRR line
Noise Level (dBA)
Hour Beginning
Leq
Lmax
L(10)
L(50)
L(90)
Ldn = 61-66 dBA

APPENDIX E

Potentially Occurring Special Status Species – City of Fremont Area

Appendix A

Potentially Occurring Special-Status Species – City of Fremont Area

Species	Status[1] Fed/State/CNPS	Characteristic Habitat	City Physical Zone of Potential Occurrence
Vascular Plants			
Astragalus tener var. tener/ Alkali milk-vetch	---/---/1B	Alkali playa, vernal pools, valley and foothill grassland, flooded lands	Flatlands, Lowlands
Atriplex depressa/ Brittlescale	---/---/1B	Chenopod scrub, meadows, valley and foothill grassland on alkali or alkali clay soils	Flatlands, Baylands
Atriplex joaquiniana/ San Joaquin spearscale	---/---/1B	Chenopod scrub, meadows, valley and foothill grassland on alkali or alkali clay soils	Flatlands, Lowlands
Balsamorhiza macrolepis var. macrolepis/ Big-scaled Balsamroot	--/--/1B	Valley needlegrass grassland, woodland, sometimes on serpentine	Hill Area
Calochortus pulchellus/ Mt. Diablo fairy-lantern	FSC/--/List 1B	Chaparral, woodland, riparian woodland, and grassland	Hill Area
Campanula exiqua/ Chaparral harebell	---/---/1B	Chaparral, rocky sites, usually on serpentine	Hill Area (Vargas)
Centromadia parryi ssp. *congdonii*/ Congdon's tarplant	--/--/List 1B	Alkaline soils in valley and foothill grasslands.	Flatlands, Hill Area
Carkia concinna ssp. automixa/ Santa Clara red ribbons	--/--/List 4	Cismontane woodland, chaparral	Hill Area
Cordylanthus maritimus ssp. palustris/ Point Reyes birds-beak	--/--/List 1B	Coastal salt marsh	Baylands

[1] FE = Federally Endangered
FT = Federally Threatened
FSC = Federal Species of Concern
CE = State of California Endangered
CT = State of California Threatened
CSC = State of California Species of Special Concern
FPE = Federally Proposed Endangered
FPT = Federally Proposed Threatened
List 1B = CNPS Rare, Threatened, or Endangered in CA & elsewhere
List 2 = CNPS Rare, Threatened, or Endangered in CA, common elsewhere
List 3 = CNPS Plant with little information, a review list.
List 4 = CNPS Plant of limited distribution, a watch list.

Potentially Occurring Special-Status Species – City of Fremont Area

Species	Status[1] Fed/State/CNPS	Characteristic Habitat	City Physical Zone of Potential Occurrence
Dirca occidentalis/Western leatherwood	--/--/List 1B	Broadleaved upland forest, closed cone coniferous forest, chaparral, woodland, North Coast coniferous forest, riparian scrub, and riparian woodland.	Hill Area
Erodium macrophyllum/ Round-leaved filaree	--/--/List 2	Woodlands and grasslands on clay soils	Hill Area, Flatlands
Eryngium aristulatum var. hooveri/ Hoover's button-celery	--/--/List 1B	Vernal pools, roadside ditches and other wet places near the coast	Lowlands
Fritillaria agrestis/ Stink Bells	--/--/List 4	Chaparral, cismontane woodland, pinyon and juniper woodland, valley and foothill grassland/clay, sometimes serpentinitie.	Hill Area
Fritillaria liliacea/ Fragrant fritillary	FSC/--/List 1B	Generally serpentine soils in open grasslands	Hill Area
Helianthella castanea /Diablo helianthella	FSC/--/List 1B	Open grassy sites, upland forest, chaparral, and riparian woodland.	Hill Area
Lasthenia conjugens/ Contra Costa goldfields	FE/--/List 1B	Moist areas in valley and foothill grasslands and vernal pools.	Flatlands, Lowlands
Malacothamnus hallii/ Hall's bush mallow	--/--/List 1B	Chaparral and picklewed marsh	Baylands, Lowlands
*Monardella villosa ssp. globosa/*Robust monardella	--/--/List 1B	Chaparral (openings), cismontane woodland, coastal scrub.	Hill Area
Navarretia prostrate/ Prostrate navarretia	--/--/List 1B	Coast scrub, valley foothill grassland, vernal pools	Flatlands, Lowlands
*Plagiobothrys glaber/*Hairless popcorn-flower	--/--/List 1A (Presumed Extinct in California)	Meadows and seeps, marshes and swamps	Flatlands, Lowlands

Potentially Occurring Special-Status Species – City of Fremont Area

Species	Status[1] Fed/State/CNPS	Characteristic Habitat	City Physical Zone of Potential Occurrence
Polemonium carneum/ Oregon polemonium	--/--/List 2	Coastal prairie, coastal scrub, lower montane coniferous forest	Flatlands, Hill Area
Streptanthus albidus ssp. peramoenus/ Most beautiful jewel-flower	FSC/--/List 1B	Chaparral, grasslands, woodlands	Hill Area
Stukenia filiformis/ Slender-leaved pondweed	--/--/List 2	Marshes and swamps, lakes and drainage channels	Flatlands, Lowlands, Hill Area
Suaeda californica/ California seablite	FE/---/List 1B	Margins of coastal slat marshes	Baylands
Animals			
*Accipiter cooperi/*Cooper's hawk (nesting)	--/CSC/--	Nests in second-growth conifer stands, or in deciduous riparian areas, usually near streams.	Hill Area
*Accipiter striatus/*Sharp-shinned hawk (nesting)	--/CSC--	Riparian areas, oak woodland canopy	Flatlands, Hill Area
Agelaius tricolor/ Tricolored blackbird	--/CSC/---	Breeds near fresh water in dense emergent vegetation.	Lowlands, Flatlands, Baylands
*Ambystoma tigrinum californiense/*California tiger salamander	FSC/CSC/--	Annual grass habitats, grassy understory of valley-foothill hardwood habitats. Breeds in vernal pools and other temporary rainwater ponds.	Hill Area, Flatlands
*Amphispiza belli belli/*Bell's sage sparrow	FSC/CSC/--	Low, dense stands of shrubs in chaparral and coastal scrub vegetation.	Hill Area
Antrozous pallidus/ Pallid bat	--/CSC/--	Roosts in caves, crevices, unused structures	Hill Area

Potentially Occurring Special-Status Species – City of Fremont Area

Species	Status[1] Fed/State/CNPS	Characteristic Habitat	City Physical Zone of Potential Occurrence
Aquila chrysaetos/ Golden eagle (nesting and wintering)	--/CSC/--	Rolling foothills, grassland an oak interface, cliff-walled or large trees in open areas provide nesting habitat.	Hill Area
*Ardea herodias/*Great blue heron (rookery)	--/CSC--	Nest in tall trees near foraging areas, marshes, lake margins, tide-flats, rivers, streams, wet meadows	Flatlands, Lowlands
Athene cunicularia/ Burrowing owl	---/CSC/---	Open, dry grassland and scrubland often in ground squirrel burrows	Flatlands, Lowlands, Baylands
*Buteo regalis/*Ferruginous hawk (wntering)	FSC/CSC/--	Uncommon winter resident of open grassland.	Hill Area, Flatlands
*Calypte costae/*Costa's hummingbird	FSC/--/--	Occurs in relatively arid habitats, primarily desert wash, edges of desert and valley foothill riparian, coast scrub, desert scrub, and lower-elevation chaparral.	Hill Area
Carduelis lawrencei/ Lawrence's goldfinch	FSC/--/--	Breeds in open oak or other arid woodland and chaparral, near water.	Hill Area
Charadrius alexandrinus nivosus/ Western snowy plover	FT/CSC	Sandy beaches, salt pond levees, shores of large alkali lakes	Baylands
*Chaetura vauxi/*Vaux's swift	FSC/CSC/--	Prefers redwood and Douglas fir habitats with nest-sites in large hollow trees with snags, especially tall, burned-out stubs or stumps.	Hill Area
*Circus cyaneus/*Northern Harrier	---/CSC/---	Coastal salt and fresh water marsh. Nest and forage in adjacent grasslands.	Baylands, Hill Area (Coyote Hills)
Dendroica petechia brewsteril Yellow warbler (nests)	--/CSC/--	Nest in deciduous sapling or shrubs in riparian habitats of cottonwood, willow, alder, and other small trees and shrubs in open-canopy riparian woodland.	Hill Area
*Elanus leucurus/*White-tailed (=black shouldered) kite (nesting)	FSC/--/-- (California Fully Protected)	Forages in relatively undisturbed, open grasslands and meadows. Nests near the top of dense oak, willow, or other tree stands near grasslands.	Flatlands, Hill Area

Potentially Occurring Special-Status Species – City of Fremont Area

Species	Status[1] Fed/State/CNPS	Characteristic Habitat	City Physical Zone of Potential Occurrence
Empidonax trailli brewsteri/Little willow flycatcher (nests)	FSC/--/--	Nests in willows or other shrubs near river valleys or large mountain meadows.	Hill Area
Emys marmorata/ Western pond turtle	FSC/CSC/--	Permanent bodies of water in many habitats. Require basking sites including partially submerged logs, vegetation mats, or open mud banks.	Hill Area, Flatlands
Eremophila alpestris actia/ California horned lark	---/CSC---	Short-grass prairie, annual grassland, coastal plains, and open fields.	Hill Area
Eumops perotis californicus/Greater western mastiff-bat	FSC/CSC/--	Crevices in cliff faces, high buildings, trees and tunnels.	Hill Area
Euphydryas edith bayensis/ Bay checkerspot butterfly	FT/---/---	Native grassland with host plants, Plantago erecta, Orthocarpus densiflora, and Orthocarpus purpurescens	Hill Area
Geothlypis trichas sinuosa/ Saltmarsh common yellowthroat	--/CSC/ --	Fresh and salt water marshes, tall grass, tule patches, and willows for nesting	Baylands, Lowlands
Hallaeetus leucocephalus/ Bald eagle (nesting and wintering)	FT/CE/ -- (California Fully Protected)	Nests in large, old growth, or dominant live tree near water. Winters near inland waters.	Hill Area
Lanius ludovicianus/ Loggerhead shrike	--/CSC/--	Nests in tall shrubs and dense trees, forages in grasslands, marshes, and ruderal habitats.	Hill Area, Flatlands
Laterallus jamaicensis coturniculus/ California black rail	---/CT/---	Freshwater marshes, wet meadows & shallow margins of saltwater marshes bordering the Bay	Flatlands, Baylands
Lepidurus packardi/ Vernal pool tadpole shrimp	FE/--/'---	Vernal pools, grass-bottomed swales in grasslands	Lowlands
Masticophis lateralis euryxanthus/Alameda whipsnake	FT/CT/--	Hardwood habitat on south-facing slopes and ravines, and rock outcrops, where shrubs (sage scrub) form a vegetative mosaic with oak trees and grasses.	Hill Area

Potentially Occurring Special-Status Species – City of Fremont Area

Species	Status[1] Fed/State/CNPS	Characteristic Habitat	City Physical Zone of Potential Occurrence
Melanerpes lewis/Lewis' woodpecker	FSC/--/--	Requires open habitats with scattered trees and snags with cavities. Usually nests in sycamore, cottonwood, oak, or conifer trees.	Hill Area
Melospiza melodia pusillula/ Alameda (South Bay) song sparrow	FSC/CSC/--	Riparian, fresh or saline emergent wetland and wet meadows.	Baylands, lowlands
Myotis evotis/Long-eared myotis bat	FSC/--/--	Roosts in building crevices, spaces under tree bark, in snags, and caves.	Hill Area
Myotis thysanodes/Fringed myotis bat	FSC/--/--	Roosts in caves, mines, buildings and crevices.	Hill Area
Myotis volans/Long-legged myotis bat/	FSC/--/--	Roosts in rock crevices, buildings, under tree bark, snags, mines, and caves. Trees most important day roost.	Hill Area
Myotis yumanensis/Yuma myotis bat	FSC/CSC/--	Roosts in buildings, mines, caves, or crevices. Sometimes under bridges and in abandoned swallow nests.	Hill Area
Neotoma fuscipes annectens/San Francisco dusky-footed woodrat	FE/CSC/ --	Forest habitat with moderate canopy and brushy understory.	Hill Area
Oncorhynchus mykiss irideus/Steelhead-Central California ESUs	FT/---/---	San Francisco Bay and creeks feeding to the Bay	Alameda Creek system in Hill Area, Flatlands, Baylands
Plecotus townsendii townsendii/ Townsend's western big-eared bat	--/CSC/--	Caves, mines, and abandoned buildings.	Hill Area
Rallus longirostris obsoletus/ California clapper rail	FE/CE/---	Pickleweed vegetation cover and mud-bottomed sloughs	Baylands
Rana aurora draytonii/ California red-legged frog	FT/CSC/--	Lowlands & foothills in or near permanent sources of deep water with dense, shrubby or emergent riparian vegetation	Hill Area, Flatlands

Potentially Occurring Special-Status Species – City of Fremont Area

Species	Status[1] Fed/State/CNPS	Characteristic Habitat	City Physical Zone of Potential Occurrence
Reithrodontomys raviventris/ Salt-marsh harvest mouse	FE/CE/--	Picklweed, saline emergent wetlands	Baylands
Riparia riparia/Bank swallow	---/CT/--	Colonial nester in riparian habitat. Requires vertical banks/cliffs with fine-textured sandy soils near streams and rivers.	Hill Area (Coyote Hills)
Rynchops niger/Black skimmer (nesting colony)	FSC/CSC/--	Requires shallow, calm water for foraging and sand bars, beaches, or dikes for roosting and nesting.	Baylands, Lowlands
Sternula antillarum brown/ California least tern	FE/CE/--	Colonial breeder on bare or sparsely vegetated, flat substrates: sand beaches, alkali flats, land fills, or paved areas.	Baylands
Sorex vagrans halicoetes/ Salt-marsh wandering shrew	--/ CSC/--	Salt marshes and pickleweed	Baylands
Tryonia imitator/ California brackishwater snail	--/ CSC/--	Coastal lagoons, estuaries and salt marshes	Baylands
Vulpes macrotis mutica/San Joaquin kit fox	FE/CT	Annual grasslands or grassy openings in scattered shrubby vegetation, on loose-textured sandy soils	Hill Area (Mission Peak)

APPENDIX F

Greenhouse Gas Emissions Calculations

Service Population GHG CO2e Emissions in Metric Tons Standard Housing

Housing Standard	Factors	Emissions Base (mtons/unit)	Emissions Adjusted (mtons/unit)
HH Size	3		
Base Emissions (mtons/unit)	18.78		
Adjusted Emissions	17.58		
Transportation		13.07	13.07
Travel Adjustments	None		
Electrical use		2.21	1.77
Natural Gas		2.63	2.11
Green Building	20%		
Solid Waste	1.5/unit	0.67	0.46
Water Use		0.2	0.17
Plumbing and irrigation	15%		
Area Source		0.1	0.1
Total		18.78	17.58
Service Population Ratio			**5.86**

1. Base Emission include Trip Rate per Unit from Urbemis 2012 Fleet and BGM Defaults with Area 5
2. Modified BGM defaults to account for 2008 Title 24 Requirements and local Green Building Ordinance 15% above Title 24
3. BGM Energy Recovery baseline, modified default to account for 2010 Fremont solid waste inventory data
4. ACWD Draft 2010 UWMP Average Use and Green Building Requirements

Service Population GHG CO2e Emissions in Metric Tons Priority Development Area Housing

Housing PDA	Factors	Emissions Base (mtons/unit)	Emissions Adjusted (mtons/unit)
HH Size	2.5		
Transportation		5.88	5.11
Travel Adjustments	13%		
Electrical use		1.35	1.08
Natural Gas		1.19	0.96
Green Building	20%		
Solid Waste	none	0.36	0.36
Water Use		0.11	0.1
Plumbing and irrigation	10%		
Area Sources		0.23	0.23
Totals		9.12	7.84
Service Population Ratio			3.14

1. Base Emission include Trip Rate per Unit from Urbemis 2012 Fleet and BGM Defaults with Area 5
2. Modified BGM defaults to account for 2008 Title 24 Requirements and local Green Building Ordinance 15% above Title 24
3. BGM Energy Recovery baseline, modified default to account for 2010 Fremont solid waste inventory data
4. ACWD Draft 2010 UWMP Average Use, includes mitigation for low flush toilet and drought tolerant water use reflecting current green building requirements
5. Trip Rates Urbemis Default modified per Travel Forecast Model 2035 Mode Shares for a 2.5% trip rate reduction home based within PDAs and reduce average trip length by 10%, effectively a 13% reduction in travel

Service Population GHG CO2e Emissions in Metric Tons Priority Development Area Employment

Employment PDA	Factors	Emissions Base(mtons/unit)	Emissions Adjusted (mtons/unit)
Office Use Employee/1000 sq. ft.	2.85		
Transportation		15.08	11.74
Travel Adjustments	23%		
Electrical use		5.58	4.52
Natural Gas		1.24	1.12
Green Building	18%		
Solid Waste	2.5/unit	3.29	0.76
Water Use		0.13	0.1
Plumbing and irrigation	25%		
Area Source		0.23	0.23
Total		25.55	18.47
Service Population Ratio			**6.48**

1. PDA Employment assumed job types include office, professional, and other. Does not include job types with atypical commute patterns or daily trip attributes, such as retail and personal service.
2. Base Emissions include trip rate per 1,000 sq. ft. from Urbemis 2012 Fleet and BGM Energy Defaults with Area 5
3. Trip Rates Urbemis Default modified per Travel Forecast Model 2035 Mode Shares for a 11% trip rate reduction (10% peak trip, 20% daily trip) and reduce average trip length of commercial nonwork to 4 miles from 5 miles, effectively a 23% reduction in travel
4. Modified BGM defaults to account for 2008 Title 24 Requirements and Calgreen cool roof requirements, includes modified natural gas increase
5. BGM Energy Recovery baseline, modified default to account for 2010 Fremont solid waste inventory data
6. Includes mitigation for low flush toilet (10%) and drought tolerant landscaping (75%) per current building and landscape code requirements.

Service Population GHG CO2e Emissions in Metric Tons Standard Employment

Employment Standard	Factors	Emissions Base (mtons/unit)	Emissions Adjusted (mtons/unit)
Employee/1000 sq. ft.	2		
Transportation		11.46	9.91
Travel Adjustments	14%		
Electrical use		3.6	2.92
Natural Gas		0.49	0.46
Green Building	18%		
Solid Waste	2.5/unit	1.37	0.76
Water Use		0.06	0.04
Plumbing and irrigation	25%		
Area Source		0.014	0.014
Total		16.99	14.10
Service Population Ratio			7.052

Standard Employment is all job types and geographies of the City, excepting office jobs in PDAs

Base Emissions include trip rate per 1,000 sq. ft. from Urbemis 2012 Fleet and BGM Energy Defaults with Area 5 Trip Rates Urbemis Defaults for aggreagrate for uses of 5% Retail, 25% Office park, 30% Warehouse, 25% manufacturing, 15% Industrial Park, commercial nonwork miles reduced from 7.3 to 6.0 results in 18% reduction in travel

Modified BGM defaults to account for 2008 Title 24 Requirements and Calgreen cool roof requirements, includes modified natural gas increase

BGM Energy Recoverey baseline, modified default to account for 2010 Fremont solid waste inventory data

Includes mitgiation for low flush toilet (10%) and drought tolerant landscaping (75%) per current building and landscape code requirements.