ILLINGWORTH & RODKIN, INC.
Acoustics • Air Quality
1 Willowbrook Court, Suite 120
Petaluma, California 94954
Tel: 707-794-0400 *Fax: 707-794-0405*
www.illingworthrodkin.com *illro@illingworthrodkin.com*

November 22, 2016

Hayes Shair, AIA, LEED GA
Wanmei Properties, Inc.

VIA E-Mail: hshair@gmail.com

SUBJECT: Omaha Subdivision, Fremont, CA - Environmental TAC Assessment

Dear Hayes,

This letter presents the results of air quality assessment that focused on the compatibility of the proposed Omaha subdivision project site with air quality policies in the Fremont General Plan related to exposure of toxic air contaminants (TACs) and fine particulate matter ($PM_{2.5}$). The Omaha property is located immediately west of Interstate 680 (I-680) in Fremont. The proposed project would construct 20 single-family homes on the site, each two stories high. Of concern are emissions of TACs, particularly diesel particulate matter (DPM) and $PM_{2.5}$, from nearby traffic. Freeway traffic is a source of TACs and $PM_{2.5}$ emissions from traffic, particularly, truck traffic. This assessment predicted exposure of the site resulting from these emissions. Measures to mitigate any substantial impacts from this exposure are identified in this report.

Community Risk Significance Thresholds

The Bay Area Air Quality Management District (BAAQMD) recommended "Thresholds of Significance" for local community risk and hazard impacts that apply to both the siting of a new source and to the siting of a new receptor.[1] Local community risk and hazard impacts are associated with TACs and $PM_{2.5}$ since emissions of these pollutants may cause localized significant health impacts.

BAAQMD Project Level Community Risk Impacts

BAAQMD considered a project would result in a significant impact if any single source of emissions of TACs or $PM_{2.5}$ affecting the project (i.e., within 1,000 feet) exceed any of the following Thresholds of Significance:

[1] BAAQMD, 2010. California Environmental Quality Act Guidelines Update Proposed Thresholds of Significance. June.

- An excess cancer risk level of more than 10.0 in one million, or a non-cancer (i.e., chronic or acute) hazard index greater than 1.0 would be significant; or
- An incremental increase greater than 0.3 $\mu g/m^3$ annual average $PM_{2.5}$ would be significant.

As noted later, the City of Fremont does not use BAAQMD's single-source cancer risk threshold.

BAAQMD Cumulative Level Community Risk Impacts

BAAQMD considered a project would have a cumulative considerable impact if the aggregate total of all past, present, and foreseeable-future sources within a 1,000-foot radius the location of the project fence line, plus the contribution from the project, exceeds the following:

- An excess cancer risk levels of more than 100 in one million or a chronic non-cancer hazard index (from all local sources) greater than 10.0; or
- 0.8 $\mu g/m^3$ annual average $PM_{2.5}$.

City of Fremont TAC Threshold

For assessing community health risk impacts to new sensitive receptors, the City has developed a significance threshold for cancer risk of 100 incidents of cancer per million for infill development within existing neighborhoods per General Plan implementation measure 7-7.3.B. This threshold takes into account the combined risk of all sources within 1,000 feet. The City does not use the BAAQMD single-source cancer risk threshold of 10 incidents of cancer per million. Since the City's General Plan does not specify the $PM_{2.5}$ concentration threshold, BAAQMD's single-source threshold of 0.3$\mu g/m^3$ (annual average) was used for this assessment.

Attachment 1 contains an explanation of how community risk levels are computed.

TAC Impacts

Community health risk assessments typically look at all substantial sources of TACs located within 1,000 feet of project sites. These sources include freeways or State highways, busy surface streets, and stationary sources identified by BAAQMD. A review of the project area using Google Earth and the BAAQMD's Google Earth map tool was used to identify sources and indicate that I-680 is the only source that poses significant TAC issues (see Figure 1).

BAAQMD provides a *Highway Screening Analysis Tool* that can be used to provide estimates of increased cancer risk, annual $PM_{2.5}$ concentrations and hazards from traffic on State Highways[2]. This tool uses Google Earth to identify roadways and their risk levels for receptors at 6 or 20 feet above ground. The roadway segment of I-680 adjacent to the site was chosen (Link 210, 6ft). A receptor height of 6 feet was selected (rather than 20 feet) since the roadway is above the project

[2] BAAQMD – see http://www.baaqmd.gov/plans-and-climate/california-environmental-quality-act-ceqa/ceqa-tools, accessed on November 1, 2016.

site. The project site is approximately 30 to 300 feet west of this portion of I-680. Due to the slope adjacent to the freeway, residential development would be over 50 feet from the freeway edge.

Figure 1- Project Site and 1,000-ft Influence Area

Table 1 Community Risk Levels from I-680

Distance from Roadway Western Edge	Annual $PM_{2.5}$ Concentration ($\mu g/m^3$)	Increased Cancer Risk* (per million)	Hazard Index
50 ft W	**0.8**	**184.6**	0.11
75 ft W	**0.6**	**158.1**	0.10
100 ft W	**0.6**	**139.2**	0.09
200 ft W	**0.4**	98.0	0.06
300 ft W	0.3	77.7	0.05
Threshold Value	0.3	100.0	1.0

* Includes adjustment for 2015 OEHHA and BAAQMD cancer risk methodology.
Note: Levels in **Bold** are above threshold value

The results presented above indicate that new residences within 300 feet of the freeway (edge of traffic lanes) would have annual $PM_{2.5}$ concentration that is above the threshold value of 0.3 $\mu g/m^3$. Residences within 200 feet of the freeway would have cancer risk greater than 100.0 per million. All new homes that are located within 300 feet of the freeway edge would be adversely

affected by freeway traffic emissions. There are no other substantial sources of TAC or $PM_{2.5}$ emissions that affect the project site.

Measures to Reduce TAC Exposure

In 2016, BAAQMD published their *Planning Healthy Places* document that includes guidance for reducing local concentrations of TACs and PM2.5, and therefore, the health risks from air pollution.

Effects of Sound Walls or Berms

Preliminary plans indicate that a sound wall would run along the project boundary with I-680. There are studies that have included particulate matter measurements behind sound walls that indicate lower concentrations due to the presence of the obstruction/barrier. A combination of sound walls and vegetation have been shown to disperse pollutants more consistently and to greater distances than either alone, with up to about a 60 percent reduction in near roadway levels.[3] However, there is not enough information available to support the quantitative effects of a sound wall or vegetation in reducing TAC $PM_{2.5}$ concentrations at the project site.

Effects of Trees/Vegetation

Planting trees and/or vegetation between sensitive receptors and the freeway, could reduce exposures. According to BAAQMD's *Planning Healthy Places,* trees that are best suited to trapping PM2.5 include Pines (Pinus nigra var. maritima), Cypress (X Cupressocyparis leylandii), Hybrid popular (Populus deltoids X trichocarpa), and Redwood (Sequoia sempervirens). However, there are no quantitative effects that these trees have in reducing the $PM_{2.5}$ concentrations.

Recommended Control Measure: Mechanical Ventilation with Filtration

Maintained ventilation systems with high-efficiency air filtration of the fresh air supply could reduce overall concentrations of DPM and $PM_{2.5}$, substantially lowering cancer risk and annual $PM_{2.5}$ concentrations.

The U.S. EPA reports particle size removal efficiency for filters rated MERV13 of 90 percent for particles in the size range of 1 to 3 µm and less than 75 percent for particles 0.3 to 1 µm.[4,5] The BAAQMD's *Planning Healthy Places* guidance indicates that MERV13 air filtration devices

[4] American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., 2007. *Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.* ANSI/ASHRAE Addendum b to Standard 52.2-2007

[4] American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., 2007. *Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.* ANSI/ASHRAE Addendum b to Standard 52.2-2007

[5] United States Environmental Protection Agency (U.S. EPA), 2009. *Residential Air Cleaners (Second Edition): A Summary of Available Information.* U.S. EPA 402-F-09-002. Revised August 2009.

installed on an HVAC air intake system can remove 80-90 percent of indoor particulate matter (greater than 0.3 microns in diameter).[6] The following measures would minimize long-term toxic air contaminant (TAC) and fine particulate matter ($PM_{2.5}$) exposure for new residences:

a. Install air filtration in all residential dwellings at the site that are within 300 feet of the project site. Air filtration devices shall be rated MERV13 or higher. To ensure adequate health protection to sensitive receptors, a ventilation system shall meet the following minimal design standards:
   - A MERV13 or higher rating (as specified above);
   - At least one air exchange(s) per hour of fresh outside filtered air; and
   - At least four air exchange(s) per hour recirculation.

   Alternately, at the approval of the City, equivalent control technology may be used if it is shown by a qualified air quality consultant or heating, ventilation, and air conditioning (HVAC) engineer that it would reduce risk below significance thresholds.

b. As part of implementing this measure, an ongoing maintenance plan for the building's HVAC air filtration system shall be required. Recognizing that emissions from air pollution sources are decreasing, the maintenance period shall last as long as $PM_{2.5}$ exposures or excess cancer risk above the thresholds are predicted. Subsequent studies could be conducted by an air quality expert approved by the City to identify the ongoing need for the filtered ventilation systems as future information becomes available.

c. For non-owner occupied units, ensure that the lease agreement and other property documents (1) require cleaning, maintenance, and monitoring of the affected units for air flow leaks; (2) include assurance that new owners and tenants are provided information on the ventilation system; and (3) include provisions that fees associated with owning or leasing a unit(s) in the building include funds for cleaning, maintenance, monitoring, and replacements of the filters, as needed.

Effectiveness

A properly installed and operated ventilation system with MERV 13 air filters would reduce $PM_{2.5}$ concentrations, including from DPM, from mobile and stationary sources by 80 percent or greater indoors when compared to outdoors. The overall effectiveness calculations take into consideration time spent outside and the outdoor exposure of each affected unit. The U.S. EPA reports that people, on average, spend 90 percent of their time indoors.[7] The overall effectiveness calculations take into effect time spent outdoors. Assuming two hours of outdoor exposure onsite plus one hour of open windows (calculated as outdoor exposure) per day, the overall effectiveness of the MERV 13 filtration systems would be 70 percent. Reducing the maximum cancer risk by 70 percent yields a mitigated cancer risk of 55.4 in one million at 50 feet to 23.3

[6] Bay Area Air Quality Management District (BAAQMD), 2016. *Planning Healthy Places A Guidebook for addressing local sources of air pollutants in community planning*. May.

[7] Klepeis, N.E., Nelsen, WC., Ott, WR., Robinson, JP., Tsang, AM., Switzer, P., Behar, JV., Hern, SC., and Engelmann, WH. 2001. *The National Human Activity Pattern Survey (NHAPS): a resource for assessing exposure to environmental pollutants*. J. Expo Anal Environ Epidemial. 2001 May-Jun;11(3):231-52.

per million at 300 feet. Annual $PM_{2.5}$ concentrations would be below of 0.3µg/m^3 throughout the site, which would not exceed the BAAQMD significance thresholds.

♦ ♦ ♦

This concludes our focused air quality assessment for the Omaha Property residential project. If you have any questions or comments regarding this analysis, please do not hesitate to call.

Sincerely yours,

James A. Reyff
Senior Consultant, Principal
ILLINGWORTH & RODKIN, INC.
(16-092)

Attachment: Community Risk Calculation Methodology

Attachment 1: Community Risk Calculation Methodology

A health risk assessment (HRA) for exposure to Toxic Air Contaminates (TACs) requires the application of a risk characterization model to the results from the air dispersion model to estimate potential health risk at each sensitive receptor location. The State of California Office of Environmental Health Hazard Assessment (OEHHA) and California Air Resources Board (CARB) develop recommended methods for conducting health risk assessments. The most recent OEHHA risk assessment guidelines were published in February of 2015.[8] These guidelines incorporate substantial changes designed to provide for enhanced protection of children, as required by State law, compared to previous published risk assessment guidelines. CARB has provided additional guidance on implementing OEHHA's recommended methods.[9] This HRA used the recent 2015 OEHHA risk assessment guidelines and CARB guidance. The BAAQMD has adopted recommended procedures for applying the newest OEHHA guidelines as part of Regulation 2, Rule 5: New Source Review of Toxic Air Contaminants.[10] Exposure parameters from the OEHHA guidelines and the recent BAAQMD HRA Guidelines were used in this evaluation.

Cancer Risk

Potential increased cancer risk from inhalation of TACs are calculated based on the TAC concentration over the period of exposure, inhalation dose, the TAC cancer potency factor, and an age sensitivity factor to reflect the greater sensitivity of infants and children to cancer causing TACs. The inhalation dose depends on a person's breathing rate, exposure time and frequency of exposure, and the exposure duration. These parameters vary depending on the age, or age range, of the persons being exposed and whether the exposure is considered to occur at a residential location or other sensitive receptor location.

The current OEHHA guidance recommends that cancer risk be calculated by age groups to account for different breathing rates and sensitivity to TACs. Specifically, they recommend evaluating risks for the third trimester of pregnancy to age zero, ages zero to less than two (infant exposure), ages two to less than 16 (child exposure), and ages 16 to 70 (adult exposure). Age sensitivity factors (ASFs) associated with the different types of exposure are an ASF of 10 for the third trimester and infant exposures, an ASF of 3 for a child exposure, and an ASF of 1 for an adult exposure. Also associated with each exposure type are different breathing rates, expressed as liters per kilogram of body weight per day (L/kg-day). As recommended by the BAAQMD, 95th percentile breathing rates are used for the third trimester and infant exposures, and 80th percentile breathing rates for child and adult exposures. Additionally, CARB and the BAAQMD recommend the use of a residential exposure duration of 30 years for sources with long-term emissions (e.g., roadways).

Under previous OEHHA and BAAQMD HRA guidance, residential receptors are assumed to be at their home 24 hours a day, or 100 percent of the time. In the 2015 Risk Assessment Guidance, OEHHA includes adjustments to exposure duration to account for the fraction of time at home (FAH), which can be less than 100 percent of the time, based on updated population and activity statistics. The FAH factors are age-specific and are: 0.85 for third trimester of pregnancy to less than 2 years old, 0.72 for ages 2 to less than 16 years, and 0.73 for ages 16 to 70 years. Use of the FAH factors is allowed by the BAAQMD if there are no schools in the project vicinity that would have a cancer risk of one in a million or greater assuming 100 percent exposure (FAH = 1.0).

---

[8] OEHHA, 2015. *Air Toxics Hot Spots Program Risk Assessment Guidelines, The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments*. Office of Environmental Health Hazard Assessment. February.
[9] CARB, 2015. *Risk Management Guidance for Stationary Sources of Air Toxics*. July 23.
[10] BAAQMD, 2016. *BAAQMD Air Toxics NSR Program Health Risk Assessment (HRA) Guidelines*. January 2016.

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

Cancer Risk (per million) = $CPF \times Inhalation\ Dose \times ASF \times ED/AT \times FAH \times 10^6$

Where:

CPF = Cancer potency factor $(mg/kg\text{-}day)^{-1}$
ASF = Age sensitivity factor for specified age group
ED = Exposure duration (years)
AT = Averaging time for lifetime cancer risk (years)
FAH = Fraction of time spent at home (unitless)

Inhalation Dose = $C_{air} \times DBR \times A \times (EF/365) \times 10^{-6}$

Where:

C_{air} = concentration in air ($\mu g/m^3$)
DBR = daily breathing rate (L/kg body weight-day)
A = Inhalation absorption factor
EF = Exposure frequency (days/year)
10^{-6} = Conversion factor

The health risk parameters used in this evaluation are summarized as follows:

Parameter	*Exposure Type* →	Infant		Child		Adult
	Age Range →	3rd Trimester	0<2	2 < 9	2 < 16	16 - 30
DPM Cancer Potency Factor $(mg/kg\text{-}day)^{-1}$		1.10E+00	1.10E+00	1.10E+00	1.10E+00	1.10E+00
Daily Breathing Rate (L/kg-day)*		361	1,090	631	572	261
Inhalation Absorption Factor		1	1	1	1	1
Averaging Time (years)		70	70	70	70	70
Exposure Duration (years)		0.25	2	14	14	14
Exposure Frequency (days/year)		350	350	350	350	350
Age Sensitivity Factor		10	10	3	3	1
Fraction of Time at Home		0.85-1.0	0.85-1.0	0.72-1.0	0.72-1.0	0.73

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

Non-Cancer Hazards

Potential non-cancer health hazards from TAC exposure are expressed in terms of a hazard index (HI), which is the ratio of the TAC concentration to a reference exposure level (REL). OEHHA has defined acceptable concentration levels for contaminants that pose non-cancer health hazards. TAC concentrations below the REL are not expected to cause adverse health impacts, even for sensitive individuals. The total HI is calculated as the sum of the HIs for each TAC evaluated and the total HI is compared to the BAAQMD significance thresholds to determine whether a significant non-cancer health impact from a project would occur.

Typically, for residential projects located near roadways with substantial TAC emissions, the primary TAC of concern with non-cancer health effects is diesel particulate matter (DPM). For DPM, the chronic inhalation REL is 5 micrograms per cubic meter ($\mu g/m^3$).

Annual $PM_{2.5}$ Concentrations

While not a TAC, fine particulate matter ($PM_{2.5}$) has been identified by the BAAQMD as a pollutant with potential non-cancer health effects that should be included when evaluating potential community health impacts under the California Environmental Quality Act (CEQA). The thresholds of significance for $PM_{2.5}$ (project level and cumulative) are in terms of an increase in the annual average concentration. When considering $PM_{2.5}$ impacts, the contribution from all sources of $PM_{2.5}$ emissions should be included. For projects with potential impacts from nearby local roadways, the $PM_{2.5}$ impacts should include those from vehicle exhaust emissions, $PM_{2.5}$ generated from vehicle tire and brake wear, and fugitive emissions from re-suspended dust on the roads.

ILLINGWORTH & RODKIN, INC.
Acoustics • Air Quality
429 E. Cotati Ave
Cotati, California 94931
Tel: 707-794-0400 *Fax: 707-794-0405*
www.Illingworthrodkin.com *illro@illingworthrodkin.com*

February 13, 2020

Hayes Shair, AIA, LEED GATITLE
Envisuality Group, Inc.
(415) 855-0384
Via Email: hayes@envisualitygroup.com

Subject: Environmental TAC Assessment for the Omaha Subdivision, Fremont, CA – 2020 Update

Dear Hayes:

Illingworth & Rodkin, Inc. conducted a screening Environmental Toxic Air Contaminant (TAC) analysis for the Omaha Subdivision project and reported results in a letter to you dated November 22, 2016. That study identified Interstate 680 as the source of TACs affecting the project site and evaluated impacts to the project site that would be caused by the freeway traffic. Since TAC and fine particulate matter (PM2.5) exposure would exceed the City's thresholds, measures to reduce TAC exposure were identified. Our understanding is that the project has not changed in that it places residences closer to the freeway.

The screening procedures and thresholds used in our 2016 analysis have not changed. Therefore, the prediction in our Nov. 22, 2016 letter are valid. We note that the building code ventilation requirements have changed since the measures to reduce TAC exposure were identified. To avoid conflicts with the ventilation designs, we recommend clarifying the "Mechanical Ventilation with Filtration" recommendations as follows:

> *Maintained ventilation systems with high-efficiency air filtration of the fresh air supply could reduce overall concentrations of DPM and $PM_{2.5}$, substantially lowering cancer risk and annual $PM_{2.5}$ concentrations.*

The U.S. EPA reports particle size removal efficiency for filters rated MERV13 of 90 percent for particles in the size range of 1 to 3 µm and less than 75 percent for particles 0.3 to 1 µm.[1,2] *The BAAQMD's Planning Healthy Places guidance indicates that MERV13 air filtration devices installed on an HVAC air intake system can remove 80-90 percent of indoor particulate matter (greater than 0.3 microns in diameter).*[3] *The following measures would minimize long-term toxic air contaminant (TAC) and fine particulate matter ($PM_{2.5}$) exposure for new residences:*

a. *Install air filtration in all residential dwellings at the site that are within 300 feet of the project site. Air filtration devices shall be rated MERV13 or higher. To ensure adequate health protection to sensitive receptors, all outside air entering the system shall be filtered and the positive pressure shall be maintained to reduce unfiltered air intrusion.*

b. *As part of implementing this measure, an ongoing maintenance plan for the building's HVAC air filtration system shall be required. Recognizing that emissions from air pollution sources are decreasing, the maintenance period shall last as long as $PM_{2.5}$ exposures or excess cancer risk above the thresholds are predicted. Subsequent studies could be conducted by an air quality expert approved by the City to identify the ongoing need for the filtered ventilation systems as future information becomes available.*

c. *For non-owner occupied units, ensure that the lease agreement and other property documents (1) require cleaning, maintenance, and monitoring of the affected units for air flow leaks; (2) include assurance that new owners and tenants are provided information on the ventilation system; and (3) include provisions that fees associated with owning or leasing a unit(s) in the building include funds for cleaning, maintenance, monitoring, and replacements of the filters, as needed.*

This concludes our review of the Omaha Subdivision TAC analysis. Please feel free to contact us if there are questions or if you require further information.

Sincerely,

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

JOB #16-092

[1] American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., 2007. *Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size*. ANSI/ASHRAE Addendum b to Standard 52.2-2007

[2] United States Environmental Protection Agency (U.S. EPA), 2009. *Residential Air Cleaners (Second Edition): A Summary of Available Information*. U.S. EPA 402-F-09-002. Revised August 2009.

[3] Bay Area Air Quality Management District (BAAQMD), 2016. *Planning Healthy Places A Guidebook for addressing local sources of air pollutants in community planning*. May.