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May 4, 2023

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Subject: CEQA Mobile Source Health Risk Assessment for a Residential Development Project at 1540 Superior Avenue, Costa Mesa, California

Dear Ms. Ing-Tan:

Yorke Engineering, LLC (Yorke) has prepared this Mobile Source Health Risk Assessment (HRA) to evaluate the potential health risk impacts of locating new residential receptors (live-work units) near surface streets and a state highway in a traditionally industrial-zoned area. This evaluation supports an Article 19 §15332 Class 32 Infill Development Project Categorical Exemption (CatEx) or a Negative Declaration (ND) for the operation (occupancy) of the proposed Project. The Mobile Source HRA was conducted to evaluate exposures of sensitive receptors (residents) to potentially substantial pollutant concentrations in accordance with the Air Quality Section (IIIc) of Appendix G of the California Environmental Quality Act (CEQA) Guidelines (Environmental Checklist Form). The proposed Project site is in the South Coast Air Basin (SCAB) within the jurisdiction of the South Coast Air Quality Management District (SCAQMD). The Lead Agency is the City of Costa Mesa (the City) Planning Division.

PROJECT DESCRIPTION

The Project site is located at 1540 Superior Avenue, where nine live-work units will be constructed.

The roadways for the Mobile Source HRA are identified as follows:

- For 1540 Superior Avenue:
  - Industrial Way west of Newport Boulevard (SR 55);
  - West 16th Street west of Newport Boulevard (SR 55);
  - Superior Avenue north of 16th Street/Industrial Way; and
  - Newport Boulevard (SR 55) north of Industrial Way.

The Project site is about 1.2 miles from the Pacific Ocean, and no major freeways or railways are near the Project site. Newport Boulevard (SR 55) is a major arterial.

Diesel vehicles, e.g., light-heavy, medium-heavy, and heavy-heavy duty trucks (LHDT, MHDT, and HHDT, respectively) emit diesel particulate matter (DPM), a toxic air contaminant (TAC) identified by the California Air Resources Board (CARB 2022a) and the Office of Environmental Health Hazard Assessment (OEHHA 2015). The proposed development is considered a "sensitive use" by the City. After reviewing the land use application, the City requested a Mobile Source HRA of the incremental cancer risk and other acute and chronic non-cancer risks, as applicable, for residents that would work and live at the two locations. If risks exceed thresholds, the documentation must identify and demonstrate that Best Available Control Technology for Toxics (T-BACT) can reduce health risks to an acceptable level. T-BACT may include installation of air filters on live-work units with a Minimum Efficiency Reporting Value (MERV) rating of 13 or better.

This report addresses the emissions and health risks for 1540 Superior Avenue.

ASSUMPTIONS

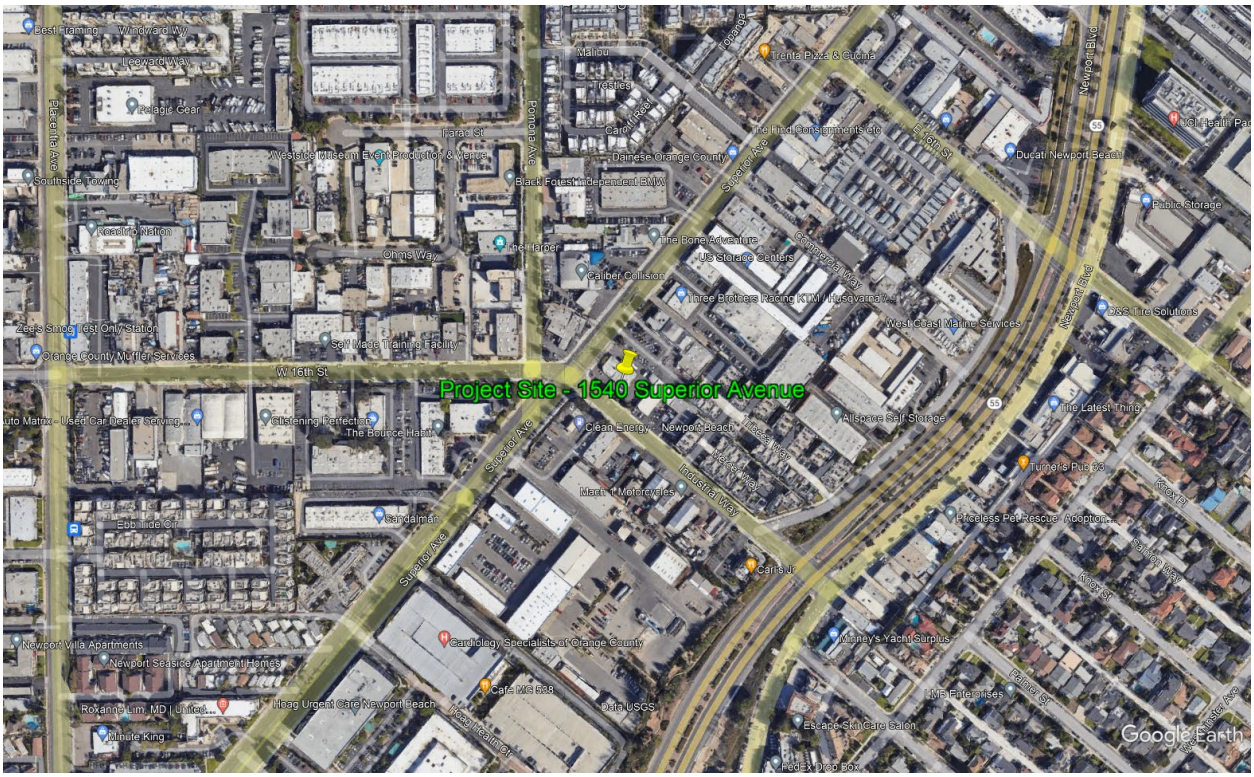
The following basic assumptions were used in developing the mobile source HRA:

- Health impacts on the residents would be from DPM quantified as 2.5-micron particulate matter ($PM_{2.5}$) from diesel vehicles on surface streets and SR 55;
- The mobile source HRA evaluates on-road traffic and does not address cumulative impacts (risks) from other sources near the proposed Project, whether stationary or mobile;
- Residential exposure is over a 30-year duration per OEHHA criteria;
- The full operational (occupancy) year for assessing residential exposure is 2023; and
- The scope of the mobile source HRA does not consider the effects of any measures that may be implemented to reduce exposures; therefore, no findings can be made with respect to the significance of the results of the mobile source HRA.

MOBILE SOURCE HEALTH RISK ASSESSMENT

A mobile source HRA for DPM emissions was performed to estimate potential long-term ambient risks to future residential receptors from diesel vehicle traffic on adjacent surface streets and SR 55, which is approximately 720 feet (220 meters) east of the Project site, as shown in Figure 1, Project Area Satellite Imagery.

Figure 1: Project Area Satellite Imagery



SUMMARY OF IMPACT ANALYSIS: Since the proposed Project would locate new residential receptors within a traditional industrial zone, adjacent to surface streets, and within 1,000 feet (304 meters) of a state highway, the Lead Agency requested an analysis of potential health risk impacts. (CARB 2005)

The residential receptors identified for the Project would be the live-work units at the Project site, as shown in Figure 1. No non-residential sensitive receptors were included in this analysis. The source-receptor topography is generally flat.

Emissions of DPM from the surface streets and SR 55 were calculated using available traffic density estimates contained in *Appendix C: Costa Mesa General Plan Update Traffic Analysis, Costa Mesa Existing Conditions Versus Proposed General Plan Traffic Analysis* and checked against Caltrans traffic census data for SR 55 (City 2016, Caltrans 2020).

Weighted average DPM (as diesel exhaust $PM_{2.5}$) emission factors (in units of grams per mile running and grams per vehicle per day idling) were computed from the EMFAC2021 database for on-road diesel vehicles (CARB 2021, SCAQMD 2003). Weighted average trip lengths were computed from the California Emissions Estimator Model (CalEEMod), version 2022, Appendix G, Table G-15. The line-volume sources (localized travel lengths) were assumed at 1,000 feet (304 meters) for all roadway segments.

The 2023 scenario year was used as the first full operational year for identifying the appropriate diesel exhaust $PM_{2.5}$ emission factors in EMFAC2021. Per mobile source HRA methodology, a conservative approach was taken where the "first year" emission factors (i.e., 2023 for this analysis) were used for all subsequent years, even though emissions would decrease over time as new less-polluting vehicles comprise the aggregated fleet. This approach compensates for possible, albeit unknown, increases in traffic volumes in the future.

The air dispersion modeling was performed using the EPA program AERMOD View™ (version 21112, EPA 2022). Local dispersion modeling parameters are consistent with other projects in the SCAB. The modeling analysis was performed using meteorological data from the John Wayne International Airport (KSNA) meteorological (MET) station (SCAQMD 2016). Because DPM only has cancer and non-cancer chronic health impacts (OEHHA 2015), a 5-year average was the only averaging time modeled. Line-volume sources were used to model DPM emissions from the roadways. The mobile source parameters used in AERMOD are shown in Table 1, and the mobile source-receptor characteristics are shown in Table 2.

Table 1: Mobile Source Parameters – Roadways – 1540 Superior Avenue

Source Type	Plume Height (m)	Plume Width (m)	Road Length (m)	Configuration	Unit Emission Rate (g/sec)
Line-Volume	1.829	3.66	250[1]	Industrial w/o Newport	0.824
Line-Volume	1.829	3.66	304	W. 16th w/o Newport	1.00
Line-Volume	1.829	3.66	304	Superior n/o 16th/Industrial	1.00
Line-Volume	1.829	3.66	304	Newport n/o Industrial	1.00

1 - Since emissions are based on a 1,000-ft (304 m) length, the emission rate was scaled to match the 250 m actual road length.
n/o - north of; s/o - south of; e/o - east of; w/o - west of

Table 2: Mobile Source-Receptor Characteristics – 1540 Superior Avenue

Roadway Location	Average Daily Traffic (veh/day)	Segment Length (feet/veh)	Travel Distance (miles/day)	Idling (veh/day)	Receptor Distance (meters)	Total DPM (lbs/yr)
Industrial w/o Newport	5,000	1,000	900	110	25	0.7
West 16th w/o Newport	2,000	1,000	400	50	100	0.3
Superior n/o 16th/Industrial	23,000	1,000	4,400	530	25	3.4
Newport n/o Industrial	51,000	1,000	9,700	1,170	220	7.4

Sources: City 2016 (Stantec), SCAQMD 2008, CalEEMod 2022, CARB/EMFAC 2021
Notes:
Minimum receptor distance 25 meters consistent with SCAQMD LST (2008)
Travel (miles/day) rounded to nearest 100 miles (2 significant figures)
Average urban trip length (Orange County) = 8.3 miles (CalEEMod 2022)
n/o - north of; s/o - south of; e/o - east of; w/o - west of

A characterizing receptor configuration was used for the air dispersion modeling to predict DPM impacts at receptor points at the front, center, and rear of the Project site relative to the sources. For this site, this approach was used to determine where the predicted ground level concentration (GLC) of DPM could be the highest.

The health risk calculations were performed using the Hotspots Analysis and Reporting Program Version 2 (HARP2) Air Dispersion Modeling and Risk Tool (ADMRT, version 22118, CARB 2022b). The GLC input file format used the long-term 5-year average GLC in units of micrograms per cubic meter ($\mu g/m^3$). Mobile source risk assessment assumptions included OEHHA/SCAQMD methodologies for residential analyses (exposure period of 30 years, Risk Management Policy [RMP] Derived Method). The residential pathways include only inhalation, as DPM only has inhalation heath risk impacts. (CARB 2022a, CARB 2005, City 2016, OEHHA 2015, SCAQMD 2019, 2016)

Calculations were performed for both assumptions that individual residents less than 16 years old in age spend 1) all their time at home (most conservative), and 2) a fraction of their time at home. The second scenario assumes that an individual resident younger than 16 years old spends a significant fraction of their time elsewhere, such as at school. However, the scope of this analysis does not address off-site risks at neighborhood schools that young residents may attend. Table 3 shows the indoor cancer and non-cancer health risks compared to SCAQMD thresholds.

Design Features

The Project design will incorporate T-BACT that will reduce health risks to future residents. High efficiency particulate arrestance (HEPA)-type air filters with a Minimum Efficiency Reporting Value (MERV) rating of 13 or better will be installed on all residential heating, ventilating, and air conditioning (HVAC) units.

The MERV rating scale was developed by the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE). The scale is used to rate the effectiveness of filters at removing particles of different sizes from an airstream. The range of sizes in the MERV scale is 0.3 to 10 microns (µm), subdivided into smaller ranges. Specific to this application, to achieve MERV-13, a filter must capture 90% of particles in the 3-10 µm range (including PM_{10}), 90% of particles in the 1-3 µm range (including $PM_{2.5}$), and 50% of particles in the range 0.3-1 µm range. In general, filters with higher MERV ratings capture higher percentages of particles as well as smaller particles, albeit with higher pressure drops across finer filters that require more energy (fan power) to operate. MERV-13 is commonly installed in residential HVAC systems where small particles, such as DPM (as PM_{10} and $PM_{2.5}$), pose a risk to building occupants. (Bailes 2018)

T-BACT: To the reduce the long-term potential risk to residents associated with exposure to DPM from nearby mobile sources to below SCAQMD thresholds, MERV 13 filtration will be incorporated into all residential HVAC systems, i.e., live-work units, as part of the proposed Project. Over the long-term, the 90% capture efficiency for particles in the 1-10 µm range, the indoor MICR results shown in Table 3 are contingent upon proper system maintenance and periodic filter changes as recommended by the HVAC vendor and filter manufacturer, respectively, during the lifetime of the proposed Project.

Table 3: AERMOD/HARP2 HRA – 1540 Superior Avenue – Indoor

Time and Age Weighted Toxic Air Contaminants Risks	<16-Year-Old Resident Time at Residence	Risk	Per million	Threshold
Residential MICR – Inhalation Only	All (1)	1.91E-06	1.9	10
Residential MICR – Inhalation Only	Fraction (2)	1.52E-06	1.5	10
Residential HIC	All (1)	5.14E-04	—	1
Residential HIC	Fraction (2)	5.14E-04	—	1

Sources: EPA 2022, CARB 2021, OEHHA 2015, SCAQMD 2019
Notes:
All (1) – All streets composite
Fraction (2) – Individual streets maxima

DISCUSSION: As shown in Table 3, indoor Maximum Individual Cancer Risk (MICR) is below the 10 in a million threshold for residents for the defined exposure period. The indoor non-cancer Chronic Hazard Index (HIC) is under the unity (1) threshold for residents[1]. (EPA 2022, CARB 2021, OEHHA 2015, SCAQMD 2019)

[1] Acute Hazard Index (HIA) does not apply to DPM.

CLOSING

As part of the HVAC design process, Berk Custom Homes should consult with the HVAC vendor for professional advice on the appropriate MERV-13 filters to install.[2]

Thank you very much for the opportunity to be of assistance to Berk Custom Homes. Should you have any questions, please contact me at (805) 293-7867 or Sean Gildea at (949) 248-8490.

Sincerely,

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Enclosures/Attachments:
Attachment 1 – Calculation Spreadsheets
Attachment 2 – Model Outputs

[2] Yorke Engineering is not an HVAC contractor or HVAC consultant and thus cannot recommend or specify any type or brand of equipment for installation as part of a building HVAC system whether residential, commercial, or industrial.

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ATTACHMENT 1 – CALCULATION SPREADSHEETS

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EMFAC Calculation of Weighted Average Emission Factors for DPM as $PM_{2.5}$ - Running Exhaust (RUNEX) & Idling Exhaust (IDLEX)											
Vehicle Category	**Fuel**	**Population**	**Population %**	**Population-Diesel only**	**Population % Diesel only**	**Total VMT (miles/year)**	**Total VMT%**	**Total VMT Diesel only**	**Total VMT % Diesel only**	**DPM as PM2.5_RUNEX (g/mile)**	**DPM as PM2.5_IDLEX (g/vehicle/day)**
HHDT	Diesel	10,709	0.46%			1,247,785	1.37%			0.023659573	0.033150724
LDA	Diesel	3,514	0.15%			107,965	0.12%			0.016074913	0.02
LDT1	Diesel	35	0.00%			542	0.00%			0.243130431	0.02
LDT2	Diesel	2,003	0.09%			85,235	0.09%			0.00494897	0.02
LHDT1	Diesel	20,789	0.90%			883,472	0.97%			0.022020343	0.026484519
LHDT2	Diesel	8,707	0.38%	81,669	3.53%	371,136	0.41%	4,112,701	4.51%	0.020269492	0.026652882
MDV	Diesel	4,631	0.20%			185,305	0.20%			0.007295627	0.02
MH	Diesel	2,944	0.13%			29,797	0.03%			0.089716742	0.02
MHDT	Diesel	27,021	1.17%			1,147,552	1.26%			0.009932325	0.020690944
OBUS	Diesel	461	0.02%			36,374	0.04%			0.032996601	0.018438193
SBUS	Diesel	854	0.04%			17,539	0.02%			0.05232541	0.044852446
HHDT	Electricity	8	0.00%			483	0.00%			0	0
LDA	Electricity	59,474	2.57%			2,727,828	2.99%			0	0
LDT1	Electricity	192	0.01%			7,504	0.01%			0	0
LDT2	Electricity	2,218	0.10%	64,282	2.78%	82,316	0.09%	2,906,602	3.19%	0	0
MDV	Electricity	2,367	0.10%			87,987	0.10%			0	0
MHDT	Electricity	19	0.00%			397	0.00%			0	0
SBUS	Electricity	1	0.00%			9	0.00%			0	0
UBUS	Electricity	4	0.00%			78	0.00%			0	0
HHDT	Gasoline	9	0.00%			607	0.00%			0.001595715	0
LDA	Gasoline	1,076,182	46.55%			42,528,217	46.62%			0.001284835	0
LDT1	Gasoline	99,224	4.29%			3,533,281	3.87%			0.001979939	0
LDT2	Gasoline	516,654	22.35%			20,968,860	22.99%			0.001324584	0
LHDT1	Gasoline	41,395	1.79%			1,651,744	1.81%			0.000997947	0
LHDT2	Gasoline	6,757	0.29%			254,112	0.28%			0.000876263	0
MCY	Gasoline	49,411	2.14%	2,128,713	92.09%	315,261	0.35%	82,355,690	90.29%	0.001913269	0
MDV	Gasoline	323,461	13.99%			12,520,790	13.73%			0.001375336	0
MH	Gasoline	6,247	0.27%			60,121	0.07%			0.001092397	0
MHDT	Gasoline	7,581	0.33%			413,802	0.45%			0.000825719	0
OBUS	Gasoline	877	0.04%			37,020	0.04%			0.000730965	0
SBUS	Gasoline	662	0.03%			29,787	0.03%			0.001203624	0
UBUS	Gasoline	255	0.01%			42,088	0.05%			0.000688826	0
HHDT	Natural Gas	1,255	0.05%			81,318	0.09%			0.002537284	0.015819333
MHDT	Natural Gas	246	0.01%			12,024	0.01%			0.000717583	0.015581558
OBUS	Natural Gas	82	0.00%	2,875	0.12%	5,163	0.01%	227,365	0.25%	0.000657331	0.003137388
SBUS	Natural Gas	716	0.03%			18,220	0.02%			0.004121837	0.012836545
UBUS	Natural Gas	576	0.02%			110,641	0.12%			0.000403945	0
LDA	Plug-in Hybrid	28,502	1.23%			1,337,250	1.47%			0.000680172	0
LDT1	Plug-in Hybrid	92	0.00%	34,105	1.48%	4,920	0.01%	1,613,891	1.77%	0.000411075	0
LDT2	Plug-in Hybrid	3,401	0.15%			174,332	0.19%			0.000522414	0
MDV	Plug-in Hybrid	2,110	0.09%			97,390	0.11%			0.000692948	0
	Total	**2,311,644**	**100.00%**		**100.00%**	**91,216,249**	**100.00%**		**100.00%**		

Source: CARB/EMFAC 2021

Weighted Average Emission Factors - All Vehicles	
DPM as PM2.5_RUNEX (g/mile)	**DPM as PM2.5_IDLEX (g/vehicle/day)**
8.4E-04	8.7E-04

Source: CARB/EMFAC 2021

Notes:

Running is sumproduct of VMT% x EF for each class (diesel only)

Idling is sumproduct of Population% x EF for each class (diesel only)

Table 2. Mobile Source-Receptor Characteristics						
Roadway Location	**Average Daily Traffic (veh/day)**	**Segment Length (feet/veh)**	**Travel Distance (miles/day)**	**Idling (veh/day)**	**Receptor Distance (meters)**	**Total DPM (lbs/yr)**
Site A						
Pomona n/o 17th	5,000	1,000	900	110	25	0.7
W. 17th w/o Pomona	10,000	1,000	1,900	230	60	1.5
Newport n/o 17th	79,000	1,000	15,000	1,810	530	11.4
Site B						
Industrial w/o Newport	5,000	1,000	900	110	25	0.7
W. 16th w/o Newport	2,000	1,000	400	50	100	0.3
Superior n/o 16th/Industrial	23,000	1,000	4,400	530	25	3.4
Newport n/o Industrial	51,000	1,000	9,700	1,170	220	7.4

Sources: City 2016 (Stantec), SCAQMD 2008, CalEEMod 2022, CARB/EMFAC 2021

Notes:

Minimum receptor distance 25 meters consistent with SCAQMD LST (2008)

Travel (miles/day) rounded to nearest 100 miles (2 significant figures)

Average urban trip length (OC) = 8.3 miles (CalEEMod 2022)

n/o - north of; s/o - south of; e/o - east of; w/o - west of

Mobile Source-Receptor DPM Impacts - Exhaust $PM_{2.5}$							
Location	**Running (miles/day)**	**Idling (veh/day)**	**Running (g/mile)**	**Idling (g/veh)**	**Running (lb/yr)**	**Idling (lb/yr)**	**Total (lb/yr)**
Site A							
Pomona n/o 17th	900	110	8.4E-04	8.7E-04	0.6	0.1	0.7
W. 17th w/o Pomona	1,900	230	8.4E-04	8.7E-04	1.3	0.2	1.5
Newport n/o 17th	15,000	1,810	8.4E-04	8.7E-04	10.1	1.3	11.4
Site B							
Industrial w/o Newport	900	110	8.4E-04	8.7E-04	0.6	0.1	0.7
W. 16th w/o Newport	400	50	8.4E-04	8.7E-04	0.3	0.0	0.3
Superior n/o 16th/Industrial	4,400	530	8.4E-04	8.7E-04	3.0	0.4	3.4
Newport n/o Industrial	9,700	1,170	8.4E-04	8.7E-04	6.6	0.8	7.4

Sources: City 2016 (Stantec), SCAQMD 2008, CalEEMod 2022, CARB/EMFAC 2021

Residential (OC)	***Miles***	***Percent***
Home-Work	*11.54*	*0.29*
Home-Shop	*6.02*	*0.12*
Home-Other	*5.95*	*0.59*
Weighted Average	***7.58***	

Non-Residential (OC)	***Miles***	***Percent***
Home-Work	*13.19*	*0.31*
Work-Other	*7.75*	*0.15*
Other-Other	*7.14*	*0.54*
Weighted Average	***9.11***	

Average Trip Length (OC)	**8.3 miles/veh**

Source: CalEEMod 2022, Appendix G, Table G-15

ATTACHMENT 2 – MODEL OUTPUTS

Maximum Cancer Risk by Pollutant at PMI, MEIR, MEIW and Sensitive Receptor
Berk Homes Mobile Source HRA - 1540 Superior

Pollutant CAS	Pollutant	Maximally Exposed Individual Resident (MEIR)	
		receptor #	43
		UTM Easting (m)	UTM Northing (m)
		414037	3721810
		30-Year Cancer Risk	Contribution (%)
-	ALL	1.91E-05	100%
9901	DieselExhPM	1.91E-05	100.00%

Cancer Risk by Source for All Pollutants Combined at PMI, MEIR, MEIW and Berk Homes Mobile Source HRA - 1540 Superior

Sources	Maximally Exposed Individual Resident (MEIR)	
	receptor #	43
	UTM Easting (m)	UTM Northing (m)
	414037	3721810
	30-Year Cancer Risk	Contribution (%)
ALL	1.91E-05	100%
Superior	1.66E-05	86.97%
Industrial	1.53E-06	8.02%
Newport	7.72E-07	4.04%
W16th	1.86E-07	0.97%

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Maximum Chronic Hazard Index by Pollutant at PMI, MEIR, MEIW and Sensitive Receptor
Berk Homes Mobile Source HRA - 1540 Superior

Pollutant CAS	Pollutant	Maximally Exposed Individual Resident (MEIR)	
		receptor #	43
		UTM Easting (m)	UTM Northing (m)
		414037	3721810
		Chronic Hazard Index	Contribution (%)
-	ALL	5.14E-03	100%
9901	DieselExhPM	5.14E-03	100.00%

Notes:
Individual pollutants are not additive because risk is based on specific target organs, which may be different per pollutant

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Chronic Hazard Index by Source for All Pollutants Combined at PMI, MEIR, MEIW and Se Berk Homes Mobile Source HRA - 1540 Superior		
Sources	**Maximally Exposed Individual Resident (MEIR)**	
	receptor #	**43**
	UTM Easting (m)	**UTM Northing (m)**
	414037	**3721810**
	Chronic Hazard Index	**Contribution (%)**
ALL	5.14E-03	100%
Superior	4.47E-03	86.97%
Industrial	4.12E-04	8.02%
Newport	2.08E-04	4.04%
W16th	4.99E-05	0.97%

Notes:
Individual sources are not additive because risk is based on specific target organs, which may be different per sou