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HEALTH RISK SCREENING ANALYSIS FOR THE OPERATION OF A GENERIC MOBILE FUELING ON-DEMAND (MFOD) SYSTEM

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Dear Mr. Okpaku:

At the request of Booster Fuels, Inc. (Booster), Ramboll US Consulting, Inc. (Ramboll) has performed a Health Risk Screening Analysis (HRSA) for a generic Mobile Fueling On-Demand (MFOD) vehicle refueling system operated in the South Coast Air Basin (SCAB). The MFOD system evaluated in this study is assumed to have large gasoline cargo tanks (i.e., greater than 120 gallons), which are certified by U.S. DOT (e.g., DOT-406 certification) mounted on a medium heavy-duty diesel truck. Specifically, Ramboll evaluated the potential health risks related to Toxic Air Contaminants (TAC) emissions from MFOD gasoline services and diesel particulate matter (DPM) emissions associated with MFOD vehicle idling. The following sections provide details on the methodology for the HRSA, key assumptions used, results and conclusions of this HRSA.

HEALTH RISK SCREENING METHODOLOGY

Ramboll evaluated the potential health risks associated with operations of a single generic MFOD at a hypothetical customer location. The HRSA evaluated the potential off-site impacts due to exposure to benzene, ethylbenzene, and naphthalene, i.e., TAC emissions from refueling operations as well as DPM emissions from idling of an MFOD truck. The analysis was performed for a hypothetical "worst-case" site under conservative assumptions, as described below. The screening methods follow the risk assessment procedures prepared by the South Coast Air Quality Management District (SCAQMD)[1] for Rule 1401 - New Source Review for Toxic Air Contaminants. Ramboll performed a Tier 3 analysis, which uses a screening dispersion model, AERSCREEN, to estimate potential health risk.

AERSCREEN is a screening air dispersion model recommended by the United States Environmental Protection Agency (USEPA). AERSCREEN produces estimates of "worst-case" 1-hour concentrations for a single source and uses conversion factors to estimate "worst-case" 3-hour, 8-hour, 24-hour, and annual concentrations. Ramboll utilized AERSCREEN to model worst-case ambient pollutant concentrations from the MFOD vehicle emissions. A X/Q approach is used where AERSCREEN is run with a unit

[1] SCAQMD. 2017. Risk Assessment Procedures (Version 8.1), September. Available at: http://www.aqmd.gov/docs/default-source/permitting/rule-1401-risk-assessment/riskassessproc-v8-1.pdf?sfvrsn=12.

emission rate of one pound per hour (1 lb/hr). The resulting output concentrations from AERSCREEN (with a unit of $\mu g m^{-3}/(lb \cdot hr^{-1})$) are multiplied by the hourly maximum and annual emissions rate (in lb/hr) to obtain maximum 1-hr and annual average pollutant concentrations.

The AERSCREEN model is appropriate for use in evaluating potential impacts from MFOD operations for the following reasons. First, the model is conservative by design and predicts the worst-case one-hour ambient pollutant concentrations without requiring data from a meteorological station representative of a single location. This is important since MFOD operations occur at various locations within the SCAB. Further, the MFOD closely resembles an industrial building with multiple fugitive emission sources, and is therefore appropriately represented by a single volume source per US EPA's AERMOD modeling guidance.[2]

The emission factor for DPM from idling (in grams of DPM per vehicle idle-hour) was obtained from the EMFAC2017 Project Level tool for a diesel-fueled medium heavy-duty truck (MHDT), engine model year 2017 and newer[3] and calendar year 2020. Emission factors are averaged over all four counties in the SCAB region. Fugitive VOC and TAC emissions from gasoline dispensing operations were included in the HRSA from breathing, refueling, spillage and hose permeation processes, and are based on a combination of CARB and USEPA emission factors for gasoline dispensing. This follows the approach used by the SCAQMD Rule 1401 Risk Assessment Procedures, with certain modifications appropriate to an MFOD system as discussed in the Key Assumptions section below.

Cancer, non-cancer chronic and acute health impacts were calculated according to SCAQMD Rule 1401 Risk Assessment Procedures and 2015 Office of Environmental Health Hazard Assessment (OEHHA) Health Risk Assessment Guidelines.[4] Exposure was conservatively assumed to be a 30-year residential exposure and 25-year worker exposure.

KEY ASSUMPTIONS

Modeling Parameters

The following summarizes key assumptions used for modeling parameters.

- Emissions were modeled as a volume source with a release height of 1.15m, an initial vertical dimension of 1.07m and an initial horizontal dimension of 0.39m, calculated based on the dimensions of a typical medium heavy-duty MFOD vehicle.[3]
- Default parameters for source elevation, minimum and maximum temperatures, and surface characteristics were used, with U* adjustment applied.[5]

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[2] USEPA AERMOD User Guide. Page 3-90: The AERMOD VOLUME source algorithms are used to model releases from a variety of industrial sources, such as building roof monitors, multiple vents, and conveyor belts. Available at: https://www3.epa.gov/ttn/scram/models/aermod/aermod_userguide.pdf. Accessed: July 2020.

[3] The MFOD vehicle is assumed to be a 2017+ Isuzu NPR XD with a 5.2L diesel engine. Vehicle dimensions (height of 2.3m and width of 1.7m) are obtained from: https://www.isuzucv.com/en/app/site/pdf?file=n_brochure.pdf. Accessed: July 2020.

[4] OEHHA. 2015. Risk Assessment Guidelines Guidance Manual for Preparation of Health Risk Assessments. February. Available at: https://oehha.ca.gov/air/crnr/notice-adoption-air-toxics-hot-spots-program-guidance-manual-preparation-health-risk-0.

[5] An option in meteorological data processing, which adjusts the calculations of friction velocity in the presence of low wind speeds.

- The urban modeling option was used with the population conservatively set to that of San Bernardino County (2,035,210).[6]
- The closest receptor was conservatively set to 25 meters (m), following SCAQMD risk assessment procedures, which state that "the 25-meter distance should be used for circumstances in which there is a receptor located very close to the permit unit, for example, a residence located with a business, another business adjacent to the facility, or a sensitive receptor located less than 50 meters from the permit unit."[7]

Table A-1 in Appendix A lists all the parameters input to the AERSCREEN model. Table A-2 in Appendix A shows the AERSCREEN output X/Q dispersion factors.

Activity Assumptions

- Annual gasoline throughput from the MFOD unit was assumed to be 500,000 gallons/year.
- The MFOD vehicle was conservatively assumed to be on site for 8 hours/day and remains idling for the entire duration.
- The MFOD vehicle was conservatively assumed to conduct refueling operations at the site for 365 days per year for 30 years.

VOC Emission Factor Assumptions

VOC emissions from a conventional gasoline dispensing facility (GDF) occur during loading, breathing, refueling, spillage and hose permeation. While an MFOD unit exhibits many of these processes, there are differences relative to a conventional GDF. Table 1 shows the emission factors used in this HRSA, which are more representative of refueling operations from a generic MFOD system than those for a conventional GDF[8] adopted by the SCAQMD.

In particular:

- There are no loading emissions associated with MFOD refueling operations as the fuel delivery vehicles dispense directly into the customer vehicles and there is no underground storage tank.
- An hourly emission rate for hose permeation VOC emissions was calculated assuming a 50-ft hose, a 1-inch hose diameter and assuming the hose contains fuel at all times.

VOC emissions are speciated into constituent TACs (benzene, ethylbenzene, and naphthalene) using speciation weight fractions tabulated in the SCAQMD Rule 1401 Risk Assessment Procedures for GDFs. Table A-3 in Appendix A contains a detailed derivation of TAC emission factors from MFOD gasoline dispensing operations.

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[6] The population of San Bernardino County is the lowest amongst all the counties in the SCAB region. This choice is conservative as a higher population correlates to greater urban heat island effect and greater dispersion as a result (e.g., see Section 5 of the AERMOD Implementation Guide).

[7] SCAQMD. 2017. Risk Assessment Procedures (Version 8.1), page 15. Available at: http://www.aqmd.gov/docs/default-source/permitting/rule-1401-risk-assessment/riskassessproc-v8-1.pdf?sfvrsn=12.

[8] CARB. 2013. Revised Emission Factors for Gasoline Marketing Operations at California Gasoline Dispensing Facilities. December. Available at: https://ww3.arb.ca.gov/vapor/gdf-emisfactor/gdfumbrella.pdf. Accessed: March 2020.

Table 1: VOC Emission Factors for Gasoline Transfer and Dispensing		
Emission Source	Conventional Gasoline Dispensing Facility[1] (lb/1000 gallons)	Generic MFOD Refueling Operations
Loading	0.15	0 (lb/1000 gallons)
Breathing	0.024	0.11 (lb/1000 gallons)[9]
Refueling	0.32	1.46 (lb/1000 gallons)[10]
Spillage	0.24	0.12 (lb/1000 gallons)[11]
Hose Permeation	0.009	0.00112 lb/hr, based on 10 $g/m^2/day$[12]

Health Risk Evaluation Parameters

Ramboll assumed that the nearest sensitive receptor could be located at 25 meters from the source. Residential exposure was conservatively assumed for all sensitive receptors, meaning all sensitive receptors were assumed to be exposed to TAC emissions from the refueling operations over a 30-year period. In reality, most refueling sites are located in commercial or industrial areas away from sensitive receptors. Further, the exposure duration for non-residential sensitive receptors, such as schools or a health care facility, would be far less than the default 30-year residential exposure. While it is expected that worker cancer risks would be less than residential cancer risks at a given receptor distance, for your reference, we also calculated worker cancer risk using worker exposure parameters from the Rule 1401 risk assessment procedures.

Table A-4 and Table A-5 in Appendix A shows the health risk parameters used in evaluating cancer, chronic and acute health impacts from MFOD fueling operations.

HRA RESULTS AND CONCLUSIONS

Table 2 below summarizes the operating characteristics of a generic MFOD unit assumed in this analysis and shows the site-specific cancer risk results from the HRSA. Based on the conservative assumptions as outlined in the sections above, we estimate that operation of the MFOD unit with a throughout of 500,000 gallons/year and 8 hours idling at a given site would result in a residential cancer risk of approximately 1.2

9 Per correspondence with SCAQMD and USEPA guidance. USEPA. AP-42 Section 5.2, Table 5.2-5 Total Uncontrolled Organic Emission Factors for Petroleum Liquid Rail Tank Cars and Tank Trucks. Available at: https://www3.epa.gov/ttn/chief/ap42/ch05/final/c05s02.pdf. Accessed: July 2020.

10 Emission factor for refueling of 87% ORVR vehicles without Phase II controls and 13% non-ORVR vehicles with no Phase II (based on calendar year 2020). CARB. 2013. Attachment 1: Revised Emission Factors for Phase II Vehicle Fueling at California Gasoline Dispensing Facilities. Available at: https://ww3.arb.ca.gov/vapor/gdf-emisfactor/attachment1.pdf. Accessed: July 2020.

11 Certified emission factor for OPW Model 14E ECO Nozzle. CARB. 2019. Executive Order NVR-1-E. Available at: https://ww3.arb.ca.gov/vapor/eos/eo-nvr1/eo_nvr1e.pdf. Accessed: July 2020.

12 Controlled Permeation Emission Factor – Vacuum Assist and Conventional Hoses at 100°F. CARB. 2013. Attachment 5 Proposed Emission Factors for Gasoline Dispensing Hose Permeation at California Gasoline Dispensing Facilities. Available at: https://ww3.arb.ca.gov/vapor/gdf-emisfactor/attachment5.pdf. Accessed: July 2020.

in a million and worker cancer risk of 0.22 in a million. Non-cancer chronic and acute impacts are well below the hazard index of 1.0. Table A-4 and Table A-5 in Appendix A show detailed calculations for cancer, chronic and acute health impacts from DPM and TACs associated with gasoline refueling operations.

Table 2. Generic MFOD Site-Specific HRA Summary

MFOD Operating Characteristics at Each Site		
Distance from the source to the closest resident[1]	25	meters
Number of trucks	1	
Maximum Daily Throughput per Truck[2]	1,370	gallons/day
Maximum Refueling Duration per Truck[2]	8	hours/day
Days operating per year	365	days/yr
Total Annual Throughput[3]	500,000	gallons/year
Total Annual Duration of Refueling[3]	2,920	hours/year
Estimated Cancer Risk from Gasoline Dispensing		
Residential Cancer Risk[4,5]	1.14	in one million
Worker Cancer Risk[4,5]	0.20	in one million
Estimated Cancer Risk from Diesel Particulate Matter from MFOD Idling		
Residential Cancer Risk[4,5]	0.08	in one million
Worker Cancer Risk[4,5]	0.02	in one million
Total Estimated Cancer Risk from MFOD Operation		
Total Residential Cancer Risk	1.22	in one million
Total Worker Cancer Risk	0.22	in one million

Notes:

1 Per SCAQMD procedures, "The 25-meter distance should be used for circumstances in which there is a receptor located very close to the permit unit, for example, a residence located with a business, another business adjacent to the facility, or a sensitive receptor located less than 50 meters from the permit unit."

2 These values represent the maximum gasoline dispensed and time spent refueling with engines idling by each truck at a given site.

3 Annual throughput and refueling duration of refueling per site is calculated assuming all trucks service the site for 365 days per year.

4 AERSCREEN model was used to calculate conservative estimates for hourly and annual pollutant concentrations at a receptor 25 m away from the MFOD vehicle. Emissions are modeled as a volume source based on vehicle dimensions.

5 Cancer risks were calculated using the maximum annual gasoline throughput and refueling duration per site and health risk coefficients consistent with SCAQMD Rule 1401 risk assessment procedures v8.1 and health risk evaluation guidelines from California ARB and OEHHA.

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Please contact the undersigned if you have any questions regarding this analysis.

Yours sincerely,

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Attachments

Appendix A
Detailed Supporting Calculations
Generic MFOD Vehicle Fueling System

Table A-1. AERSCREEN Input Parameters
Generic MFOD Site-Specific HRA

Parameter	Units or Input Options	Value
Units	E/M	(M)etric
Source Type	P, V, A, C, F, S, H	(V)olume
Emission Rate	g/s	0.1260
Vehicle Height[1]	m	2.3063
Vehicle Width[1]	m	1.6662
Release Height[1]	m	1.1532
Initial Lateral Dimension[1]	m	0.3875
Initial Vertical Dimension[1]	m	1.0727
Rural or Urban[2]	R/U	(U)rban
Enter population of urban area[2]	people	2,035,210
Minimum distance to Ambient Air[3]	m	25
Model NO2 chemistry		1 (no chemistry)
Include Building Downwash?	Y/N	N
Include terrain heights?	Y/N	N
Maximum distance to probe[4]	m	5000
Include up to 10 discrete receptors?	Y/N	N
Enter name of file with discrete receptors		--
Use flagpole receptors?	Y/N	N
Enter Flagpole receptor height	m	--
Source Elevation[4]	m	0
Minimum Ambient Temperatures[4]	K	250
Maximum Ambient Temperatures[4]	K	310
Minimum wind speed[4]	m/s	0.5
Anemometer height[4]	m	10
Surface characteristics option		2 (AERMET Seasonal Tables)
Dominant surface profile		7 (Urban)
Dominant climate profile		1 (Average Moisture)
Adjust U*?	Y/N	Y
Apply inversion break-up fumigation?	Y/N	N
Apply shoreline fumigation?	Y/N	N
Debug option?	Y/N	N

Notes:

[1] Release height, initial lateral dimension and initial vertical dimension are calculated following guidance from US EPA's Transportation Conformity Guidance for Quantitative Hot-spot Analyses in PM2.5 and PM10 Nonattainment and Maintenance Areas and vehicle dimensions of the MFOD unit. Per guidance, release parameters are calculated assuming that the vehicles themselves are inducing no turbulence. US EAP guidance is available online at: https://nepis.epa.gov/Exe/ZyPdf.cgi?Dockey=P100NN22.pdf

MFOD unit parameters are taken from manufacturer specifications, available online at: https://www.isuzucv.com/en/app/site/pdf?file=n_brochure.pdf.

[2] Population of San Bernardino County is obtained from South Coast AQMD Modeling Guidance. Available online at: http://www.aqmd.gov/docs/default-source/air-quality/meterorological-data/met-data-information/2017FinalMetStationList_101317.pdf?sfvrsn=6

[3] Per SCAQMD procedures, "The 25-meter distance should be used for circumstances in which there is a receptor located very close to the permit unit, for example, a residence located with a business, another business adjacent to the facility, or a sensitive receptor located less than 50 meters from the permit unit." Available online at: http://www.aqmd.gov/docs/default-source/permitting/rule-1401-risk-assessment/riskassessproc-v8-1.pdf?sfvrsn=12.

[4] Parameters for maximum probe distance ambient temperatures, minimum wind speed and anemometer height are assumed to be default values provided within AERSCREEN.

Table A-2. AERSCREEN Output Dispersion Factors
Generic MFOD Site-Specific HRA

Averaging Time	1-hour	3-hour	8-hour	24-hour	Annual
Dispersion Factor (**µ**g m^{-3} / (lb·hr^{-1})) @ 25m	206	206	185.4	123.6	20.6

Abbreviations:
µg - Microgram
hr - hour
lb - pounds
m - meter

Table A-3. VOC Emission Factors from MFOD Gasoline Dispensing
Generic MFOD Site-Specific HRA

Hose Permeation Emission Factor

Parameter	Value	Units
Number of Hoses	1	
Hose Permeation[1]	10.00	$g/m^2/day$
Hose Length[2]	50	ft
	15.24	m
Hose Diameter[3]	1	in
	0.0254	m
Hose surface area	1.22	m^2
VOC Emissions from Hose Permeation[4]	12.16	g/day
	0.0011	lb/hr

TAC Speciation (Percentage of VOC by weight)[5]

	Loading	Breathing	Refueling	Spillage	Hose Permeation
Benzene	0.455%	0.455%	0.455%	0.707%	0.455%
Ethylbenzene	0.107%	0.107%	0.107%	1.290%	0.107%
Naphthalene	0.0004%	0.0004%	0.0004%	0.174%	0.0004%

VOC and TAC Emission Factors

	Loading Emission Factor (lbs/kgal)[6]	Breathing Emission Factor (lbs/kgal)[7]	Refueling Emission Factor (lbs/kgal)[8]	Spillage Emission Factor (lbs/kgal)[9]	Hose Permeation Emission Factor (lbs/hr)
VOC EF	0	0.11	1.46	0.12	0.0011
Benzene	0.00E+00	5.01E-04	6.63E-03	8.48E-04	5.08E-06
Ethylbenzene	0.00E+00	1.18E-04	1.56E-03	1.55E-03	1.20E-06
Naphthalene	0.00E+00	4.84E-07	6.41E-06	2.09E-04	4.92E-09

Notes:

[1] Hose permeation emission factor is obtained from Controlled Permeation Emission Factor – Vacuum Assist and Conventional Hoses. CARB. 2013. Attachment 5 Proposed Emission Factors for Gasoline Dispensing Hose Permeation at California Gasoline Dispensing Facilities. Available at: https://ww3.arb.ca.gov/vapor/gdf-emisfactor/attachment5.pdf. Accessed: July 2020

[2] A hose length of 50 feet was assumed to reflect equipment typically installed on MFOD systems.

[3] Hose diameter is assumed per manufacturer specification for hose model CP16LP50. Available online at: https://www.husky.com/husky/husky-hoses/eagleflexlow-perm-hardwall/#Specifications

[4] VOC emissions from hose permeation is calculated by multiplying the hose permeation rate ($g/m^2/day$) by the total surface area of the hose and dividing by 24 hours/day to obtain an hourly emissions rate.

[5] TAC speciation is taken from South Coast AQMD Rule 1401 Risk Assessment Procedures for Gasoline Dispensing Facilities. Available online at: http://www.aqmd.gov/docs/default-source/permitting/rule-1401-risk-assessment/riskassessproc-v8-1.pdf?sfvrsn=12

[6] There are no loading emissions associated with MFOD refueling operations as the fuel delivery vehicles dispense directly into the customer vehicles.

[7] Per correspondence with SCAQMD and USEPA guidance. USEPA. AP-42 Section 5.2, Table 5.2-5 Total Uncontrolled Organic Emission Factors for Petroleum Liquid Rail Tank Cars and Tank Trucks. Available at: https://www3.epa.gov/ttn/chief/ap42/ch05/final/c05s02.pdf. Accessed: July 2020.

[8] The refueling emission factor is a weighted emission factor accounting for the distribution of ORVR and non-ORVR vehicles being fueled based on Attachment 1: Revised Emission Factors for Phase II Vehicle Fueling at California Gasoline Dispensing Facilities. Available at: https://ww3.arb.ca.gov/vapor/gdf-emisfactor/attachment1.pdf.

[9] The spillage emission factor is the certified emission factor for OPW Model 14E ECO Nozzle per CARB Executive Order NVR-1-E from https://ww3.arb.ca.gov/vapor/eos/eo-nvr1/eo_nvr1e.pdf.

Abbreviations:

ft - feet	hr - hour	lb - pounds	TAC - Toxic Air Contaminant
g - grams	kgal - thousands of gallons	m - meter	VOC - Volatile Organic Compound

Table A-4. Emissions and Health Risk Calculations - Residential Exposure
Generic MFOD Refueler Scenario
Booster Fuels

EMFAC Classification	MHDT	
Duration of idling per year	2,920	hours/year
Throughput per year	500,000	gallons/year

	Idle Emission Factors[1] (g/idle-hr)	Max Hourly Emissions (lb/hr)	Annual Emissions (lb/yr)[2]
DPM	0.0073	0.0000161	0.0470

	Loading Emission Factor (lbs/kgal)	Breathing Emission Factor (lbs/kgal)	Refueling Emission Factor (lbs/kgal)	Spillage Emission Factor (lbs/kgal)	Hose Permeation Emission Factor (lbs/hr)	Max Hourly Emissions (lb/hr)[3]	Annual Emissions (lb/yr)[3]
Benzene	0.00E+00	5.01E-04	6.63E-03	8.48E-04	5.08E-06	0.0013715	4.0049
Ethylbenzene	0.00E+00	1.18E-04	1.56E-03	1.55E-03	1.20E-06	0.0005534	1.6160
Naphthalene	0.00E+00	4.84E-07	6.41E-06	2.09E-04	4.92E-09	0.0000369	0.1079

Risk Calculations[4]	Inhalation Unit Cancer Risk Factor $(ug/m^3)^{-1}$	Cancer Potency Factor $(mg/kg\text{-}day)^{-1}$	Residential CEF	Acute REL (ug/m^3)	Chronic REL (ug/m^3)	Cancer MP_R	Chronic MP	Molecular Weight Adjustment Factor	Hourly Concentration (ug/m^3)[5]	Annual Concentration (ug/m^3)[5]	Residential Cancer Risk (in a million)	Hazard Index Acute	Hazard Index Chronic
DPM	3.00E-04	1.1	677.4	--	5.00E+00	1	1	1	0.00332	0.00011	0.082	--	2.21E-05
Benzene	2.90E-05	1.00E-01		2.70E+01	3.00E+00	1	1	1	0.28254	0.00942	0.638	1.05E-02	3.14E-03
Ethylbenzene	2.50E-06	8.70E-03		--	2.00E+03	1	1	1	0.11401	0.00380	0.022	--	1.90E-06
Naphthalene	3.40E-05	1.20E-01		--	9.00E+00	23.12	1	1	0.00761	0.00025	0.477	--	2.82E-05
										Total	1.22	0.010	0.003

Notes:

[1] Idling Diesel PM10 emission factor is obtained from EMFAC2017 PL tool for model year 2017+ MHDT, calendar year 2020, averaged across all four counties within the South Coast Air Basin.

[2] Annual DPM emissions is calculated by multiplying the hourly DPM emission rate by the number of hours the MFOD vehicle is assumed to idle per year.

[3] Annual TAC emissions are calculated by multiplying TAC emission factors by total annual fuel throughput. Hose permeation emissions are calculated by multiplying the hourly emissions factor by the number of hours of refueling on site. Maximum hourly TAC emissions are calculated by dividing annual emissions by the duration of refueling per year.

[4] Exposure factors and health risk coefficients are taken from South Coast AQMD Rule 1401 Risk Assessment Procedures and California ARB and OEHHA health risk evaluation guidelines. Available online at: http://www.aqmd.gov/docs/default-source/permitting/rule-1401-risk-assessment/attachmentn-v8-1.pdf?sfvrsn=4 and https://ww3.arb.ca.gov/toxics/healthval/contable.pdf

[5] Hourly maximum pollutant concentrations are calculated by multiplying the hourly dispersion factor calculated by AERSCREEN with the hourly emission rate. Annual average pollutant concentrations are calculated by multiplying the annual dispersion factor calculated by AERSCREEN with the annual emissions divided by the number of hours in a year (8760).

Table A-5. Emissions and Health Risk Calculations - Worker Exposure
Generic MFOD Refueler Scenario
Booster Fuels

EMFAC Classification	MHDT	
Duration of idling per year	2,920	hours/year
Throughput per year	500,000	gallons/year

	Idle Emission Factors[1] (g/idle-hr)	Max Hourly Emissions (lb/hr)	Annual Emissions (lb/yr)[2]
DPM	0.0073	0.0000161	0.0470

	Loading Emission Factor (lbs/kgal)	Breathing Emission Factor (lbs/kgal)	Refueling Emission Factor (lbs/kgal)	Spillage Emission Factor (lbs/kgal)	Hose Permeation Emission Factor (lbs/hr)	Max Hourly Emissions (lb/hr)[3]	Annual Emissions (lb/yr)[3]
Benzene	0.00E+00	5.01E-04	6.63E-03	8.48E-04	5.08E-06	0.0013715	4.0049
Ethylbenzene	0.00E+00	1.18E-04	1.56E-03	1.55E-03	1.20E-06	0.0005534	1.6160
Naphthalene	0.00E+00	4.84E-07	6.41E-06	2.09E-04	4.92E-09	0.0000369	0.1079

Risk Calculations[4]	Inhalation Unit Cancer Risk Factor $(ug/m^3)^{-1}$	Cancer Potency Factor $(mg/kg\text{-}day)^{-1}$	Worker CEF	Acute REL (ug/m^3)	Chronic REL (ug/m^3)	Cancer MP_W	Chronic MP	Molecular Weight Adjustment Factor	Worker Adjustment Factor[5]	Hourly Concentration (ug/m^3)[6]	Annual Concentration (ug/m^3)[6]	Worker Cancer Risk (in a million)	Hazard Index Acute	Hazard Index Chronic
DPM	3.00E-04	1.1	55.86	--	5.00E+00	1	1	1	3	0.00332	0.00011	0.020	--	2.21E-05
Benzene	2.90E-05	1.00E-01		2.70E+01	3.00E+00	1	1	1	3	0.28254	0.00942	0.158	1.05E-02	3.14E-03
Ethylbenzene	2.50E-06	8.70E-03		--	2.00E+03	1	1	1	3	0.11401	0.00380	0.006	--	1.90E-06
Naphthalene	3.40E-05	1.20E-01		--	9.00E+00	6.62	1	1	3	0.00761	0.00025	0.034	--	2.82E-05
											Total	0.22	0.010	0.003

Notes:

[1] Idling Diesel PM10 emission factor is obtained from EMFAC2017 PL tool for aggregated model MHDT, calendar year 2020, averaged across all four counties within the South Coast Air Basin.

[2] Annual DPM emissions is calculated by multiplying the hourly DPM emission rate by the number of hours the MFOD vehicle is assumed to idle per year.

[3] Annual TAC emissions are calculated by multiplying TAC emission factors by total annual fuel throughput. Hose permeation emissions are calculated by multiplying the hourly emissions factor by the number of hours of refueling on site. Maximum hourly TAC emissions are calculated by dividing annual emissions by the duration of refueling per year.

[4] Exposure factors and health risk coefficients are taken from South Coast AQMD Rule 1401 Risk Assessment Procedures and California ARB and OEHHA health risk evaluation guidelines. Available online at: http://www.aqmd.gov/docs/default-source/permitting/rule-1401-risk-assessment/attachmentn-v8-1.pdf?sfvrsn=4 and https://ww3.arb.ca.gov/toxics/healthval/contable.pdf

[5] Based on an 8-hr workday and 7-day/week operation.

[6] Hourly maximum pollutant concentrations are calculated by multiplying the hourly dispersion factor calculated by AERSCREEN with the hourly emission rate. Annual average pollutant concentrations are calculated by multiplying the annual dispersion factor calculated by AERSCREEN with the annual emissions divided by the number of hours in a year (8760).