

Appendix E.5

Air Quality and GHG Emissions Supplement



VALERO CRUDE BY RAIL PROJECT AIR QUALITY AND GREENHOUSE GAS EMISSIONS SUPPLEMENT

11-Jun-14

CRITERIA POLLUTANT EMISSIONS

Source	Round Trip Mileage	ROG	NO _x	CO	Sox	PM ₁₀	PM _{2.5}
Long Line Haul within Bay Area (tons/year)*	44.00	1.02	21.42	4.22	0.02	0.57	0.55
Long Line Haul emission factor - tons/(1,000 miles rail haul-1,000,000 barrels)		0.91	19.05	3.75	0.01	0.51	0.49
Baseline Main Marine Vessel Engine Emissions within Bay Area**	98.97	2.00	36.00	3.00	5.00	1.00	1.00
Baseline Main Vessel Engine Emissions Displaced - within Bay Area	98.97	1.64	29.56	2.46	4.10	0.82	0.82
Baseline Main Vessel Engines emission factor - tons/(1,000 miles marine vessel haul-1,000,000 barrels-year)		0.65	11.69	0.97	1.62	0.32	0.32

*Source data from Appendix E.3. Attachment B-4, Cargo Carrier Emissions, Train Criteria Pollutant and GHG Emissions, page 6, second table, row "BAAQMD Border to Valero Refinery." PDF page 40 indicates that the total track length in BAAQMD is 22 miles.

**Source data from Appendix E.2. Marine Vessel Criteria Pollutant and GHG Baseline Emissions; round trip of 86 nm within Bay Area Basin. These values were converted to miles.

1 mile = 0.86898 nautical miles

Emission Sources for Example Crude Oil Origins	Approximate One-way Distance (miles)	Emissions					
		ROG	NO _x	CO	SO _x	PM ₁₀	PM _{2.5}
Baseline Marine Vessel Main Engines - Alaska (tons/year)	2,000.00	66.37	1,194.58	99.55	165.91	33.18	33.18
Baseline Marine Vessel Main Engines - South America (tons/year)	4,000.00	132.73	2,389.16	199.10	331.83	66.37	66.37
Baseline marine Vessel Main Engines - Middle East Origin	8,500.00	282.05	5,076.97	423.08	705.14	141.03	141.03
Baseline Marine Vessel Main Engines - Composite Baseline Origin	7,305.00	242.40	4,363.21	363.60	606.00	121.20	121.20
Locomotives – large line haul from North America (tons/year)	1,500.00	69.55	1,460.45	287.73	1.02	38.93	37.77
Net Emissions with Alaskan Origin Baseline (tons/year)		3.18	265.87	188.18	-164.89	5.75	4.59
Net Emissions with South American Origin Baseline (tons/year)		-63.19	-928.71	88.63	-330.81	-27.43	-28.59
Net Emissions with Middle East Origin Baseline		-212.51	-3,616.52	-135.35	-704.11	-102.10	-103.25
Net Emissions with Composite Baseline Origin Baseline		-172.86	-2,902.76	-75.87	-604.98	-82.27	-83.43

Emission within other Air Districts	Approximate roundtrip Distance (miles)	Emissions					
		ROG	NO _x	CO	SO _x	PM ₁₀	PM _{2.5}
Locomotives – large line haul in Yolo-Solano AQMD (tons/yr)	64.00	1.48	31.16	6.14	0.02	0.83	0.81
Locomotives – large line haul in Yolo-Solano AQMD (lbs/yr)		8.13	170.72	33.63	0.12	4.55	4.42
Locomotives – large line haul Sacramento Metro District (tons/yr)	31.00	0.72	15.09	2.97	0.01	0.40	0.39
Locomotives – large line haul Sacramento Metro District (lbs/yr)		3.94	82.69	16.29	0.06	2.20	2.14
Locomotives – large line haul Placer County (tons/yr)	5.00	0.12	2.43	0.48	0.00	0.06	0.06
Locomotives – Switching (tons/yr)		0.50	8.13	1.04	0.00	0.18	0.18
Locomotives - Placer County Total (tons/yr)		0.62	10.57	1.52	0.01	0.24	0.24
Locomotives – large line haul Placer County (lbs/yr)		0.64	13.34	2.63	0.01	0.36	0.34
Locomotives – Switching (lbs/yr)		2.75	44.57	5.72	0.02	0.99	0.99
Locomotives - Placer County Total (lbs/day)		3.38	57.91	8.34	0.03	1.34	1.33

GHG EMISSIONS

Marine Vessel Baseline CO2e Emissions within California	pounds*	tons*	metric tons
Total Emissions over Baseline Period	94,311,916		42,779.60
Annual Average Emissions over Baseline Period		15,718.65	14,259.87
Estimated Baseline Emissions Offset by Project		12,904.98	11,707.32

*Source data from Appendix E.2. 138 mile round trips within California.

Source	Round Trip Mileage	CO₂e (tons/year)	CO₂e (metric tons/year)
Long Line Haul from Roseville to Refinery*	136.00	5,058.00	4,588.59
Long Line Haul emission factor - metric tons/(1,000 miles rail haul-1,000,000 barrels-year)			1,320.53
Average Long Line Haul from State Line to Roseville	390.0		13,158.45
Small Line Haul within Refinery*		149.00	135.17
Switching within Refinery*		387.00	351.08
Baseline Vessel Engine Emissions from CA Coastal Waters Boundary to the Sea Buoy**	138.09	4,150.35	3,765.18
Baseline Vessel Engine Emissions from CA Coastal Waters Boundary to the Sea Buoy Displaced	138.09		3,091.20
Baseline Main Vessel Engines emission factor - metric tons/(1,000 miles marine vessel haul-1,000,000 barrels-year)			876.12
Indirect Emissions - Electricity Consumption***		198.00	179.62
Amortized Construction Emissions			20.00
Total Project emissions within California (metric tons/year)			18,432.92
Total Project Net emissions within California (metric tons/year)			6,725.59

*Source data from ERM, 2013b. Attachment B-4, Cargo Carrier Emissions, Train Criteria Pollutant and GHG Emissions, page 6, second table, row "BAAQMD Border to Valero Refinery." PDF page 40 identifies track length between Roseville rail yard and Refinery is 68 miles. Average long line haul from State line to Roseville represents a composite distance between Roseville and the Oregon and Nevada borders = (100 + 290)/2 = 195.

**Source data from ERM, 2014a. Attachment B-4, Marine Vessel Criteria Pollutant and Greenhouse Gas Baseline Emissions.

***Source data from Valero response to comments.

1 mile = 0.86898 nautical miles

Emission Sources for Example Crude Oil Origins	Approximate Distance (miles)	tons per 25,550,000 barrels delivered per year
		CO₂e
Baseline Marine Vessel Main Engines - Alaska	2,000	89,540
Baseline Marine Vessel Main Engines - South America	4,000	179,080
Baseline Marine Vessel Main Engines - Middle East	8,500	380,544
Baseline Marine Vessel Main Engines - Composite Baseline Origin	7,305	327,044
Locomotives – large line haul from North America	1,500	101,219
Net Emissions with Alaskan Origin Baseline		11,679
Net Emissions with South American Origin Baseline		-77,861
Net Emissions with Middle East Origin Baseline		-279,325
Net Emissions with Composite Origin Baseline		-225,825