

Appendix 5.0

Energy Calculations

Operation-Related Vehicle Fuel/Energy Usage

PROPOSED COMMUTE

Year	Gas		Diesel		CNG		Electricity	
	VMT	Gallons	VMT	Gallons	VMT	Gallons	VMT	kWh
Proposed Project	1,735,250	65,857	208,652	23,984	1,894	506	16,978	5,687
Total	1,735,250	65,857	208,652	23,984	1,894	506	16,978	5,687

Proposed Facilities

PROPOSED CONDITIONS

Vehicle type	Fleet percent		VMT
	Place of		
	Worship	Place of Worship	
LDA	54.21%	1,064,051	1,064,051
LDT1	3.76%	73,757	73,757
LDT2	18.52%	363,512	363,512
MDV	11.85%	232,595	232,595
LHD1	1.62%	31,877	31,877
LHD2	0.51%	10,091	10,091
MHD	1.74%	34,137	34,137
HHD	6.87%	134,833	134,833
OBUS	0.14%	2,715	2,715
UBUS	0.12%	2,322	2,322
MCY	0.46%	8,993	8,993
SBUS	0.09%	1,855	1,855
MH	0.10%	2,037	2,037
	100.00%	1,962,774	1,962,774

4.2 Trip Summary Information

Land Use	Average daily trip rate			Unimproved	Mitigated
	Wednesday	Saturday	Sunday		
Place of Worship	87,139	133,189	205,110	1,962,774	1,962,774
City Park	0.00	0.00	0.00		
Other Asphalt Surfaces	0.00	0.00	0.00		
Parking Lot	0.00	0.00	0.00		
Single Family Housing	0.00	0.00	0.00		
Total	87,139	133,189	205,110	1,962,774	1,962,774

4.4 Fleet Mix

Land Use	LDA	Ldt1	Ldt2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Place of worship	0.542116	0.037576	0.185203	0.118503	0.016241	0.005141	0.017302	0.068865	0.001383	0.001183	0.004582	0.000645	0.001038
City Park	0.542116	0.037576	0.185203	0.118503	0.016241	0.005141	0.017302	0.068865	0.001383	0.001183	0.004582	0.000645	0.001038
Other Asphalt Surfaces	0.542116	0.037576	0.185203	0.118503	0.016241	0.005141	0.017302	0.068865	0.001383	0.001183	0.004582	0.000645	0.001038
Parking Lot	0.542116	0.037576	0.185203	0.118503	0.016241	0.005141	0.017302	0.068865	0.001383	0.001183	0.004582	0.000645	0.001038
Single Family Housing	0.542116	0.037576	0.185203	0.118503	0.016241	0.005141	0.017302	0.068865	0.001383	0.001183	0.004582	0.000645	0.001038

PROPOSED CONDITIONS

Vehicle type	Gas percent	Diesel percent	CNG percent	Electricity percent
LDA	97.77%	0.93%	0.00%	1.30%
LDT1	99.55%	0.03%	0.00%	0.42%
LDT2	98.84%	0.60%	0.00%	0.56%
MDV	97.49%	2.18%	0.00%	0.33%
LHD1	49.89%	50.11%	0.00%	0.00%
LHD2	28.88%	71.12%	0.00%	0.00%
MHD	9.74%	90.26%	0.00%	0.00%
HHD	0.02%	99.68%	0.30%	0.00%
OBUS	52.31%	47.69%	0.00%	0.00%
UBUS	35.23%	0.09%	64.26%	0.42%
MCY	100.00%	0.00%	0.00%	0.00%
SBUS	34.91%	65.09%	0.00%	0.00%
MH	70.26%	29.74%	0.00%	0.00%

<< Equal to T6 (<https://www.arb.ca.gov/msei/downloads/emfac2014/emfac2014-vol3-technical-documentation-052015.pdf>)
 << Equal to T7 (<https://www.arb.ca.gov/msei/downloads/emfac2014/emfac2014-vol3-technical-documentation-052015.pdf>)
 << Motor coach, all other buses, and OBUS (<https://www.arb.ca.gov/msei/downloads/emfac2014/emfac2014-vol3-technical-documentation-052015.pdf>)

PROPOSED CONDITIONS

Vehicle type	VMT	Gasoline		Diesel		CNG		Electricity		
		mpg	Gallons	mpg	Gallons	mpg	Gallons	m/kWh	kWh	
LDA	1,040,276	31.06	33,493	50.87	195	0	0	13,864	2,98	4,647
LDT1	73,425	26.33	2,789	25.57	1	0	0	309	2.98	104
LDT2	359,305	24.57	14,624	37.89	58	0	0	2,027	2.98	679
MDV	226,767	19.73	11,492	27.98	181	0	0	767	2.98	257
LHD1	15,903	10.66	1,492	20.76	770	0	0	0	0.00	0
LHD2	2,914	9.30	313	19.03	377	0	0	0	0.00	0
MHD	3,326	5.14	647	10.77	2,861	0	0	0	0.00	0
HHD	23	4.16	6	7.01	19,186	402	2.32	173	0	0.00
OBUS	1,420	5.08	280	9.27	140	0	0	0	0.00	0
UBUS	818	6.16	133	8.92	0	1,492	4.48	333	10	0.00
MCY	8,993	38.29	235	0.00	0	0	0	0	0.00	0
SBUS	647	8.94	72	7.52	161	0	0	0	0.00	0
MH	1,431	5.10	280	10.81	56	0	0	0	0.00	0
	1,735,250		65,857		23,984	1,894		506	16,978	5,687

Appendix C: Evidence Used to Define the Average Number of KWH Required to Displace a Gallong of Gasoline

Table A 3: Evidence from U.S. Department of Energy and U.S. Environmental Protection Agency's fuel economy website^[32]

Vehicle	Model year	Electric consumption	Gasoline fuel economy	Number of kWh that are equivalent to 1 gallon
Ford Fusion Energi & Ford C-Max Energi	2013	0.34 kWh per mile	43 mpg	14.6
Chevrolet Volt	2013	0.35 kWh per mile	37 mpg	12.9
Chevrolet Volt	2012	0.36 kWh per mile	37 mpg	13.3
Fisker Karma	2012	0.62 kWh per mile	20 mpg	12.4
Toyota Prius	2013	0.29 kWh per mile & 0.2 gal	50 mpg	13.1
Average for five models	-	-	-	13.3 +/- 0.8

Table A 5: Average power consumption per mile traveled over time for different PEV categories

Year range	2012- 2020	2020-2030	2030-2040	2040-2050	2050
Efficiency improvement per year	0.3%	0.8%	0.9%	0.9%	
Year	2012	2020	2030	2040	2050
Relative energy efficiency	1.000	0.976	0.901	0.823	0.752

https://www.fhwa.dot.gov/environment/climate_change/mitigation/publications_and_tools/ev_deployment/page08.cfm

0.34	14.6	2013	0.34
0.35	12.9	2014	0.34
0.36	13.3	2015	0.34
0.34	13.3	2016	0.34
		2017	0.34
		2018	0.34
		2019	0.34
		2020	0.33
		2021	0.33
		2022	0.33
		2023	0.33
		2024	0.32
		2025	0.32
		2026	0.32
		2027	0.32
		2028	0.31
		2029	0.31
		2030	0.31
		2031	0.31
		2032	0.30
		2033	0.30
		2034	0.30
		2035	0.29

EMFAC Fuel Usage: Year 2021

Vehicle type	VMT/day	Gasoline Gallons/day	Miles/gallon	VMT/day
All other buses	0	0	#DIV/0!	16,652
LDA	29,816,029	959,977	31.06	284,052
LDT1	3,017,206	114,603	26.33	937
LDT2	9,631,964	392,036	24.57	58,422
LHD1	692,854	65,012	10.66	695,952
LHD2	108,726	11,692	9.30	267,714
MCY	267,522	6,988	38.29	0
MDV	7,677,993	389,092	19.73	171,355
MH	50,695	9,933	5.10	21,462
Motor coach	0	0	#DIV/0!	8,203
OBUS	27,261	5,369	5.08	0
PTO	0	0	#DIV/0!	43,216
SBUS	19,229	2,151	8.94	35,859
T6	103,977	20,222	5.14	963,068
T7	650	156	4.16	3,782,718
UBUS	23,018	3,736	6.16	59
Total	51,437,124	1,980,968	25.97	6,349,668

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EMFAC2017 (v1.0.2) Emissions Inventory

Region Type: County

Region: RIVERSIDE

Calendar Year: 2021

Season: Annual

Vehicle Classification: EMFAC2011 Categories

Units: miles/day for VMT, trips/day for Trips, tons/day for Emissions, 1000 gallons/day for Fuel Consumpt

Region	CalYr	VehClass	MdlYr	Speed
RIVERSIDE	2021	All Other Buses	Aggregated	Aggregated
RIVERSIDE	2021	LDA	Aggregated	Aggregated
RIVERSIDE	2021	LDA	Aggregated	Aggregated
RIVERSIDE	2021	LDA	Aggregated	Aggregated
RIVERSIDE	2021	LDT1	Aggregated	Aggregated
RIVERSIDE	2021	LDT1	Aggregated	Aggregated
RIVERSIDE	2021	LDT1	Aggregated	Aggregated
RIVERSIDE	2021	LDT2	Aggregated	Aggregated
RIVERSIDE	2021	LDT2	Aggregated	Aggregated
RIVERSIDE	2021	LDT2	Aggregated	Aggregated
RIVERSIDE	2021	LHD1	Aggregated	Aggregated

RIVERSIDE	2021 LHD1	Aggregated	Aggregated
RIVERSIDE	2021 LHD2	Aggregated	Aggregated
RIVERSIDE	2021 LHD2	Aggregated	Aggregated
RIVERSIDE	2021 MCY	Aggregated	Aggregated
RIVERSIDE	2021 MDV	Aggregated	Aggregated
RIVERSIDE	2021 MDV	Aggregated	Aggregated
RIVERSIDE	2021 MDV	Aggregated	Aggregated
RIVERSIDE	2021 MH	Aggregated	Aggregated
RIVERSIDE	2021 MH	Aggregated	Aggregated
RIVERSIDE	2021 Motor Coach	Aggregated	Aggregated
RIVERSIDE	2021 OBUS	Aggregated	Aggregated
RIVERSIDE	2021 PTO	Aggregated	Aggregated
RIVERSIDE	2021 SBUS	Aggregated	Aggregated
RIVERSIDE	2021 SBUS	Aggregated	Aggregated
RIVERSIDE	2021 T6 Ag	Aggregated	Aggregated
RIVERSIDE	2021 T6 CAIRP heavy	Aggregated	Aggregated
RIVERSIDE	2021 T6 CAIRP small	Aggregated	Aggregated
RIVERSIDE	2021 T6 instate construction heavy	Aggregated	Aggregated
RIVERSIDE	2021 T6 instate construction small	Aggregated	Aggregated
RIVERSIDE	2021 T6 instate heavy	Aggregated	Aggregated
RIVERSIDE	2021 T6 instate small	Aggregated	Aggregated
RIVERSIDE	2021 T6 OOS heavy	Aggregated	Aggregated
RIVERSIDE	2021 T6 OOS small	Aggregated	Aggregated
RIVERSIDE	2021 T6 Public	Aggregated	Aggregated
RIVERSIDE	2021 T6 utility	Aggregated	Aggregated
RIVERSIDE	2021 T6TS	Aggregated	Aggregated
RIVERSIDE	2021 T7 Ag	Aggregated	Aggregated
RIVERSIDE	2021 T7 CAIRP	Aggregated	Aggregated
RIVERSIDE	2021 T7 CAIRP construction	Aggregated	Aggregated
RIVERSIDE	2021 T7 NNOOS	Aggregated	Aggregated
RIVERSIDE	2021 T7 NOOS	Aggregated	Aggregated
RIVERSIDE	2021 T7 POLA	Aggregated	Aggregated
RIVERSIDE	2021 T7 Public	Aggregated	Aggregated
RIVERSIDE	2021 T7 Single	Aggregated	Aggregated
RIVERSIDE	2021 T7 single construction	Aggregated	Aggregated
RIVERSIDE	2021 T7 SWCV	Aggregated	Aggregated
RIVERSIDE	2021 T7 SWCV	Aggregated	Aggregated
RIVERSIDE	2021 T7 tractor	Aggregated	Aggregated
RIVERSIDE	2021 T7 tractor construction	Aggregated	Aggregated
RIVERSIDE	2021 T7 utility	Aggregated	Aggregated
RIVERSIDE	2021 T7IS	Aggregated	Aggregated
RIVERSIDE	2021 UBUS	Aggregated	Aggregated
RIVERSIDE	2021 UBUS	Aggregated	Aggregated
RIVERSIDE	2021 UBUS	Aggregated	Aggregated
RIVERSIDE	2021 UBUS	Aggregated	Aggregated

Diesel			Natural Gas		Electricity
Gallons/day	Miles/gallon	VMT/day	Gallons/day	Miles/gallon	VMT/day
1,576	10.57	0	0	#DIV/0!	0
5,584	50.87	0	0	#DIV/0!	397,377
37	25.57	0	0	#DIV/0!	12,704
1,542	37.89	0	0	#DIV/0!	54,349
33,525	20.76	0	0	#DIV/0!	0
14,070	19.03	0	0	#DIV/0!	0
0	#DIV/0!	0	0	#DIV/0!	0
6,125	27.98	0	0	#DIV/0!	25,974
1,986	10.81	0	0	#DIV/0!	0
1,235	6.64	0	0	#DIV/0!	0
0	#DIV/0!	0	0	#DIV/0!	0
8,649	5.00	0	0	#DIV/0!	0
4,768	7.52	0	0	#DIV/0!	0
89,416	10.77	0	0	#DIV/0!	0
539,964	7.01	11,323	4,871	2.32	0
7	8.92	41,980	9,369	4.48	272
708,483	8.96	53,303	14,241	3.74	490,676

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Fuel	Population	VMT	Trips	Fuel_Consumption
DSL	284.8937709	16652.06628	2393.107675	1.575730136
GAS	750300.8612	29816029.44	3552291.91	959.9773206
DSL	6761.576428	284051.9489	32376.67879	5.583640967
ELEC	10150.83139	397377.3325	51147.16781	0
GAS	80587.47931	3017205.799	366690.8629	114.6030537
DSL	42.61597748	937.3229162	139.3726002	0.036656565
ELEC	312.6717202	12704.03137	1592.29706	0
GAS	246596.5095	9631963.535	1154462.896	392.0360383
DSL	1288.993364	58422.33846	6390.044979	1.541969714
ELEC	1692.169129	54349.02026	8602.010432	0
GAS	20885.97436	692854.0522	311169.8978	65.01212921

DSL	19999.77791	695951.6473	251572.0463	33.5251513
GAS	3292.646696	108726.4545	49055.52973	11.69203093
DSL	7676.540568	267713.7518	96561.22326	14.06993865
GAS	35659.71718	267522.3909	71319.43436	6.987624248
GAS	208791.3729	7677992.855	957457.8464	389.092347
DSL	3985.674779	171354.6461	19488.49703	6.125080214
ELEC	787.1076762	25973.70389	4035.648056	0
GAS	6261.085587	50694.80757	626.3590021	9.933138973
DSL	2593.424644	21461.98811	259.3424644	1.985654976
DSL	63.09921941	8203.062048	921.2486034	1.235324527
GAS	589.4801253	27261.01125	11794.31835	5.36936518
DSL	0	43215.87089	0	8.649135663
GAS	475.4713498	19228.87737	1901.885399	2.150891371
DSL	1131.955947	35858.75931	13062.61469	4.767855011
DSL	7.60124176	167.4608368	33.44546374	0.017863675
DSL	145.1197468	28546.77605	2118.748303	2.414747344
DSL	77.10276625	4045.297479	1125.700387	0.364857059
DSL	1023.416789	69641.75508	4626.827514	6.676474611
DSL	2375.313105	122904.9546	10738.6982	11.62153744
DSL	2224.333635	285436.3248	25668.50175	25.37945251
DSL	8654.845551	416293.2653	99875.71771	39.31023129
DSL	82.68537058	16378.66974	1207.20641	1.384894769
DSL	45.24353184	2355.80026	660.5555649	0.212587275
DSL	923.8656177	13985.24257	2802.392371	1.70502468
DSL	196.8324614	3312.563965	2263.573306	0.328638566
GAS	1963.203703	103976.7898	39279.77968	20.22169968
DSL	9.50057431	112.1224494	41.80252696	0.019320917
DSL	5030.578003	893354.9809	73446.43884	127.5093819
DSL	276.8404972	50024.27764	1251.585124	6.683366323
DSL	5429.189937	1089092.759	79266.17308	149.7477449
DSL	1975.177994	350984.9942	28837.59872	51.33201416
DSL	2687.173339	339511.6021	20422.51738	53.14813449
DSL	1009.655505	20458.15996	3062.621697	3.432902394
DSL	2954.897319	217643.7639	34099.10538	31.1483993
DSL	1764.975066	124101.0318	7979.383652	18.22003571
DSL	100.3426156	4099.67574	391.3362007	2.026184992
NG	278.9618671	11322.92601	1087.951282	4.871361355
DSL	4410.276486	588364.2661	56010.51137	81.16951899
DSL	1473.858764	102372.4253	6663.258167	15.12990321
DSL	128.0259824	2597.467976	1472.298797	0.397027482
GAS	8.256088183	649.7325832	165.1878124	0.15635274
GAS	163.4848401	23017.81637	653.9393604	3.736316018
DSL	1.105797941	58.57190354	4.423191762	0.006566346
ELEC	5.058469431	271.5303965	20.23387772	0
NG	306.621625	41979.73406	1226.4865	9.369372368