

Appendix 5.15-1 Energy Calculations

Appendices

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Operation-Related Vehicle Fuel/Energy Usage

PROPOSED COMMUTE

Year	Gas		Diesel		CNG		Electricity	
	VMT	Gallons	VMT	Gallons	VMT	Gallons	VMT	kWh
Proposed Project	688,871	28,341	44,070	4,744	1,345	390	6,324	2,120
Total	688,871	28,341	44,070	4,744	1,345	390	6,324	2,120

Proposed Facilities

PROPOSED CONDITIONS

Vehicle type	Fleet percent	VMT	
		Congregate Care (Assisted Living)	Congregate Care (Assisted Living)
		Living	Total
LDA	58.83%	435,712	435,712
LDT1	4.29%	31,782	31,782
LDT2	18.44%	136,605	136,605
MDV	11.08%	82,054	82,054
LHD1	1.73%	12,808	12,808
LHD2	0.56%	4,116	4,116
MHD	1.55%	11,505	11,505
HHD	2.30%	17,050	17,050
OBUS	0.19%	1,409	1,409
UBUS	0.20%	1,499	1,499
MCY	0.62%	4,578	4,578
SBUS	0.07%	552	552
MH	0.13%	941	941
	100.00%	740,609	740,609

4.2 Trip Summary Information

Land Use	Average Daily Trip Rate			Unmitigated Annual VMT	Mitigated Annual VMT
	Weekday	Saturday	Sunday		
Congregate Care (Assisted Living)	271.26	217.80	241.56	740,609	740,609
Total	271.26	217.80	241.56	740,609	740,609

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Congregate Care (Assisted Living)	0.588316	0.042913	0.184449	0.110793	0.017294	0.005558	0.015534	0.023021	0.001902	0.002024	0.006181	0.000745	0.001271

PROPOSED CONDITIONS

Vehicle type	Gas percent	Diesel percent	CNG percent	Electricity percent
LDA	97.59%	1.10%	0.00%	1.31%
LDT1	99.77%	0.05%	0.00%	0.18%
LDT2	99.10%	0.56%	0.00%	0.34%
MDV	97.65%	2.25%	0.00%	0.10%
LHD1	53.60%	46.40%	0.00%	0.00%
LHD2	32.82%	67.18%	0.00%	0.00%
MHD	14.78%	85.22%	0.00%	0.00%
HHD	0.11%	98.36%	1.53%	0.00%
OBUS	56.71%	43.29%	0.00%	0.00%
UBUS	25.84%	1.82%	72.34%	0.00%
MCY	100.00%	0.00%	0.00%	0.00%
SBUS	11.54%	88.46%	0.00%	0.00%
MH	74.66%	25.34%	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	425,198	28.97	14,678	43.50	110	0	0	5,722	1,918
LDT1	31,710	24.49	1,295	22.22	1	0	0	57	19
LDT2	135,370	22.17	6,106	31.81	24	0	0	464	156
MDV	80,128	18.46	4,341	24.21	76	0	0	81	27
LHD1	6,865	8.23	835	17.64	337	0	0	0	0
LHD2	1,351	7.19	188	15.74	176	0	0	0	0
MHD	1,700	4.65	365	8.94	1,097	0	0	0	0
HHD	19	3.83	5	6.10	2,748	260	2.40	109	0
OBUS	799	4.60	173	7.39	82	0	0	0	0
UBUS	387	5.38	72	4.73	6	1,084	3.86	281	0
MCY	4,578	36.50	125	0.00	0	0	0	0	0
SBUS	64	9.17	7	488	62	0	0	0	0
MH	703	4.63	152	239	9.55	25	0	0	0
	688,871		28,341	44,070	4,744	1,345	390	6,324	2,120

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 2019

Vehicle type	VMT/day	Gasoline Gallons/day	Miles/gallon	VMT/day
All other buses	0	0	#DIV/0!	29,427
LDA	52,523,886	1,813,130	28.97	591,969
LDT1	5,870,445	239,667	24.49	2,721
LDT2	18,303,424	825,540	22.17	104,229
LHD1	1,338,981	162,786	8.23	1,159,049
LHD2	194,787	27,093	7.19	398,691
MCY	671,702	18,404	36.50	0
MDV	11,949,483	647,368	18.46	275,255
MH	105,761	22,846	4.63	35,905
Motor coach	0	0	#DIV/0!	23,498
OBUS	69,331	15,058	4.60	0
PTO	0	0	#DIV/0!	26,736
SBUS	9,805	1,069	9.17	75,145
T6	189,550	40,724	4.65	1,093,117
T7	1,990	520	3.83	1,781,260
UBUS	37,246	6,926	5.38	2,628
Total	91,266,393	3,821,129	23.88	5,599,631

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EMFAC2017 (v1.0.2) Emissions Inventory

Region Type: Sub-Area

Region: San Diego (SD)

Calendar Year: 2019

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	MdYr	Speed
San Diego (SD)	2019	All Other Buses	Aggregated	Aggregated
San Diego (SD)	2019	LDA	Aggregated	Aggregated
San Diego (SD)	2019	LDA	Aggregated	Aggregated
San Diego (SD)	2019	LDA	Aggregated	Aggregated
San Diego (SD)	2019	LDT1	Aggregated	Aggregated
San Diego (SD)	2019	LDT1	Aggregated	Aggregated
San Diego (SD)	2019	LDT1	Aggregated	Aggregated
San Diego (SD)	2019	LDT2	Aggregated	Aggregated
San Diego (SD)	2019	LDT2	Aggregated	Aggregated
San Diego (SD)	2019	LDT2	Aggregated	Aggregated
San Diego (SD)	2019	LHD1	Aggregated	Aggregated

San Diego (SD)	2019 LHD1	Aggregated	Aggregated
San Diego (SD)	2019 LHD2	Aggregated	Aggregated
San Diego (SD)	2019 LHD2	Aggregated	Aggregated
San Diego (SD)	2019 MCV	Aggregated	Aggregated
San Diego (SD)	2019 MDV	Aggregated	Aggregated
San Diego (SD)	2019 MDV	Aggregated	Aggregated
San Diego (SD)	2019 MDV	Aggregated	Aggregated
San Diego (SD)	2019 MH	Aggregated	Aggregated
San Diego (SD)	2019 MH	Aggregated	Aggregated
San Diego (SD)	2019 Motor Coach	Aggregated	Aggregated
San Diego (SD)	2019 OBUS	Aggregated	Aggregated
San Diego (SD)	2019 PTO	Aggregated	Aggregated
San Diego (SD)	2019 SBUS	Aggregated	Aggregated
San Diego (SD)	2019 SBUS	Aggregated	Aggregated
San Diego (SD)	2019 T6 Ag	Aggregated	Aggregated
San Diego (SD)	2019 T6 CAIRP heavy	Aggregated	Aggregated
San Diego (SD)	2019 T6 CAIRP small	Aggregated	Aggregated
San Diego (SD)	2019 T6 instate construction heavy	Aggregated	Aggregated
San Diego (SD)	2019 T6 instate construction small	Aggregated	Aggregated
San Diego (SD)	2019 T6 instate heavy	Aggregated	Aggregated
San Diego (SD)	2019 T6 instate small	Aggregated	Aggregated
San Diego (SD)	2019 T6 OOS heavy	Aggregated	Aggregated
San Diego (SD)	2019 T6 OOS small	Aggregated	Aggregated
San Diego (SD)	2019 T6 Public	Aggregated	Aggregated
San Diego (SD)	2019 T6 utility	Aggregated	Aggregated
San Diego (SD)	2019 T6TS	Aggregated	Aggregated
San Diego (SD)	2019 T7 Ag	Aggregated	Aggregated
San Diego (SD)	2019 T7 CAIRP	Aggregated	Aggregated
San Diego (SD)	2019 T7 CAIRP construction	Aggregated	Aggregated
San Diego (SD)	2019 T7 NNOOS	Aggregated	Aggregated
San Diego (SD)	2019 T7 NOOS	Aggregated	Aggregated
San Diego (SD)	2019 T7 other port	Aggregated	Aggregated
San Diego (SD)	2019 T7 POLA	Aggregated	Aggregated
San Diego (SD)	2019 T7 Public	Aggregated	Aggregated
San Diego (SD)	2019 T7 Single	Aggregated	Aggregated
San Diego (SD)	2019 T7 single construction	Aggregated	Aggregated
San Diego (SD)	2019 T7 SWCV	Aggregated	Aggregated
San Diego (SD)	2019 T7 SWCV	Aggregated	Aggregated
San Diego (SD)	2019 T7 tractor	Aggregated	Aggregated
San Diego (SD)	2019 T7 tractor construction	Aggregated	Aggregated
San Diego (SD)	2019 T7 utility	Aggregated	Aggregated
San Diego (SD)	2019 T7IS	Aggregated	Aggregated
San Diego (SD)	2019 UBUS	Aggregated	Aggregated
San Diego (SD)	2019 UBUS	Aggregated	Aggregated
San Diego (SD)	2019 UBUS	Aggregated	Aggregated

Diesel			Natural Gas		Electricity
Gallons/day	Miles/gallon	VMT/day	Gallons/day	Miles/gallon	VMT/day
3,487	8.44	0	0	#DIV/0!	0
13,608	43.50	0	0	#DIV/0!	706,843
122	22.22	0	0	#DIV/0!	10,565
3,276	31.81	0	0	#DIV/0!	62,741
65,699	17.64	0	0	#DIV/0!	0
25,329	15.74	0	0	#DIV/0!	0
0	#DIV/0!	0	0	#DIV/0!	0
11,367	24.21	0	0	#DIV/0!	12,089
3,760	9.55	0	0	#DIV/0!	0
3,862	6.08	0	0	#DIV/0!	0
0	#DIV/0!	0	0	#DIV/0!	0
5,681	4.71	0	0	#DIV/0!	0
9,598	7.83	0	0	#DIV/0!	0
122,312	8.94	0	0	#DIV/0!	0
291,858	6.10	27,663	11,542	2.40	0
555	4.73	104,275	27,020	3.86	0
560,516	9.99	131,938	38,562	3.42	792,238

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Fuel	Population	VMT	Trips	Fuel_Consumption
DSL	559.1868303	29426.79953	4697.169374	3.487410705
GAS	1344406.247	52523886.14	6338460.676	1813.1298
DSL	15026.56773	591969.3053	70444.74535	13.60798221
ELEC	18333.83525	706843.1707	91793.86049	0
GAS	164988.733	5870445.074	748122.6427	239.6669216
DSL	144.4296352	2721.383158	486.9054988	0.122472253
ELEC	286.012665	10565.01905	1408.284212	0
GAS	492012.6637	18303424.09	2287564.406	825.5396042
DSL	2366.231951	104229.3644	11677.61487	3.276485661
ELEC	1765.558567	62740.84285	9016.81681	0
GAS	36760.80522	1338981.061	547681.2242	162.7858714

DSL	30036.17125	1159049.221	377817.2488	65.69863562
GAS	5297.23272	194787.1886	78920.87465	27.09307775
DSL	10008.64946	398690.6184	125896.2193	25.32888227
GAS	77891.01626	671702.3837	155782.0325	18.4036948
GAS	325016.4395	11949483.27	1497366.159	647.3676997
DSL	6169.32466	275254.8377	30234.12248	11.36735973
ELEC	336.744095	12089.25876	1723.694329	0
GAS	12216.59668	105760.8051	1222.148331	22.84575502
DSL	3756.201522	35904.97708	375.6201522	3.760271512
DSL	186.2157401	23497.93031	2718.749806	3.861856838
GAS	1285.754091	69330.87235	25725.36785	15.05772279
DSL	0	26735.81766	0	5.680721932
GAS	181.7676098	9804.980315	727.0704393	1.068996654
DSL	2398.072352	75144.66691	27673.42246	9.597623008
DSL	34.90319122	455.0663961	153.5740414	0.050947361
DSL	80.36539463	16108.5545	1173.334762	1.518555353
DSL	42.67873333	2275.634914	623.1095066	0.226828618
DSL	663.6714573	44630.12639	3000.432855	5.672361097
DSL	2315.076779	116728.9836	10466.37211	14.80172043
DSL	2649.770957	353882.5753	30577.98947	37.38888243
DSL	10344.46265	506929.2125	119373.6647	55.87969592
DSL	46.11926841	9262.898491	673.3413188	0.87312007
DSL	24.71980098	1310.254606	360.9090944	0.130673323
DSL	2347.324972	36329.45365	7120.219075	5.157253536
DSL	311.4471011	5204.712395	3581.641663	0.612217151
GAS	3469.654951	189550.1207	69420.85627	40.72352851
DSL	14.28251547	262.0509297	62.84306809	0.045481937
DSL	1709.59245	321070.7891	24960.04978	49.54740282
DSL	168.9670227	32058.20748	763.8933403	5.777942744
DSL	1918.346757	391410.5823	28007.86265	58.83671776
DSL	673.466731	126144.7324	9832.614272	19.90664485
DSL	491.7445351	79503.97902	3737.258467	14.92518608
DSL	218.6770454	26218.46382	1661.945545	5.147175417
DSL	1471.378401	29820.44622	4463.181144	6.013991694
DSL	2055.209502	134646.9218	23716.83271	23.01108629
DSL	1143.709504	79530.51628	5170.666198	15.28934902
DSL	730.6600078	29853.58407	2849.574031	13.46932465
NG	680.6811335	27662.88817	2654.656421	11.5419868
DSL	3290.612789	462625.6334	41790.78242	66.73526914
DSL	936.0035236	65605.674	4231.635538	12.70231953
DSL	123.6167341	2508.905369	1421.592442	0.450545463
GAS	22.61914946	1990.278482	452.5639424	0.520196015
GAS	354.5052362	37246.48827	1418.020945	6.925770879
DSL	25	2628.078835	100	0.555482686
NG	926.1724999	104275.3376	3704.69	27.02021675