

**Appendix D:
Energy Supporting Information**

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Baumgardner Ranch Development Project Energy Calculations

Summary of Annual Energy Use During Construction

Construction off-site fuel	99,338 gallons (gasoline, diesel)
Construction on-site fuel	99,597 gallons (diesel)
Construction office electricity	79,523 kilowatt hours

Summary of Annual Energy Use During Operations

Operation Vehicle Fuel	239,005 gallons (gasoline, diesel)
Operation Natural Gas	4,248,657 kilo-British Thermal Units
Operation Electricity	1,087,742 kilowatt hours

Off-Site Construction Vehicle Fuel Consumption Calculations

California Air Resource Board. 2019. EMFAC2014 Web Database. March. Website: <https://www.arb.ca.gov/emfac/2014/>. Accessed March 21, 2019

VMT = Vehicle Miles Traveled
FE = Fuel Economy

EMFAC2014 (v1.0.7) Emissions Inventory
Region Type: County
Region: Sonoma
Calendar Year: 2020
Season: Annual
Vehicle Classification: EMFAC2007 Categories
Units: miles/day for VMT, trips/day for Trips, tons/day for Emissions, 1000 gallons/day for Fuel Consumption

Given						Calculations				
Region	CalYr	VehClass	MdlYr	Speed	Fuel	Population	VMT (mi/day)	Fuel_Consumption (1000 gallons/day)	FE (mi/gallon)	VMT*FE
Sonoma	2020	HHDT	Aggregated	Aggregated	GAS	121.367313	15394.32197	3.217092	4.785167	73664.40394
Sonoma	2020	HHDT	Aggregated	Aggregated	DSL	10104.7822	1290919.174	229.5602	5.623445	7259413.534
Sonoma	2020	LDA	Aggregated	Aggregated	GAS	1309865.38	43129965.61	1502.728	28.70111	1237877847
Sonoma	2020	LDA	Aggregated	Aggregated	DSL	13067.4126	456777.4316	12.01521	38.01661	17365131.5
Sonoma	2020	LDT1	Aggregated	Aggregated	DSL	94.6301736	2293.886451	0.078512	29.2171	67020.69919
Sonoma	2020	LDT1	Aggregated	Aggregated	GAS	444734.258	16972020.92	792.3434	21.42003	363541222.6
Sonoma	2020	LDT2	Aggregated	Aggregated	GAS	24285.6494	688074.5102	62.42459	11.02249	7584295.867
Sonoma	2020	LDT2	Aggregated	Aggregated	DSL	19034.2596	667146.618	32.61079	20.45785	13648385.13
Sonoma	2020	LHDT1	Aggregated	Aggregated	GAS	4004.66641	120218.4496	12.59599	9.544186	1147387.299
Sonoma	2020	LHDT1	Aggregated	Aggregated	DSL	4912.27977	162367.0728	9.518304	17.0584	2769723.213
Sonoma	2020	LHDT2	Aggregated	Aggregated	GAS	5075.28369	171137.4343	16.70587	10.24415	1753157.813
Sonoma	2020	LHDT2	Aggregated	Aggregated	DSL	7692.68633	297308.1294	15.85015	18.75743	5576737.786
Sonoma	2020	MDV	Aggregated	Aggregated	GAS	30921.91	1023389.696	66.4403	15.40315	15763422.73
Sonoma	2020	MDV	Aggregated	Aggregated	DSL	405.060643	17910.54541	0.838064	21.37134	382772.3739
Sonoma	2020	MHDT	Aggregated	Aggregated	GAS	66.4402959	15195.45571	2.426673	6.261846	95151.60897
Sonoma	2020	MHDT	Aggregated	Aggregated	DSL	0.83806371	248076.6053	29.94827	8.283502	2054943.166

Worker Trips
Sum of VMT*FE (Column L) **1656230098**
Total VMT (Column H) **62957579.22**
Weighted Average FE **26.3070804 miles/gallon**

Vendor
Sum of VMT*FE (Column L) **25626185.48**
Total VMT (Column H) **1773017.867**
Weighted Average FE **14.45342767 miles/gallon**

Haul
Sum of VMT*FE (Column L) **7333077.938**
Total VMT (Column H) **1306313.496**
Weighted Average FE **5.6135667 miles/gallon**

Baumgardner Ranch Development Project Construction Assumptions

AQ/GHG Appendix: CalEEMod Baumgardner Ranch Development Project
Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	0	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

Trips and VMT Phase Name	Trips per Day			Worker Trip Length	Trips per Phase			Num Days	VMT per Phase			Fuel Consumption (gallons)		
	Worker Trip Number	Vendor Trip Number	Hauling Trip Number		Worker Trip Number	Vendor Trip Number	Hauling Trip Number		Worker Trips	Vendor Trips	Hauling Trips	Worker Trips	Vendor Trips	Hauling Trips

Site work for the entire project site

Demolition	10	0	15	10.8	7.3	20	29	290	0	15	3,132	0	300	119.06	0.00	53.44
Site Preparation	18	0	0	10.8	7.3	20	22	396	0	0	4,277	0	0	162.57	0.00	0.00
Grading	20	0	0	10.8	7.3	20	43	860	0	0	9,288	0	0	353.06	0.00	0.00
Off-site																
								0	0	0	0	0	0	0.00	0.00	0.00
Site Preparation	20	0	0	10.8	7.3	20	1	20	0	0	216	0	0	8.21	0.00	0.00
Grading	23	0	0	10.8	7.3	20	2	46	0	0	497	0	0	18.88	0.00	0.00
Paving	18	0	0	10.8	7.3	20	5	90	0	0	972	0	0	36.95	0.00	0.00
Parcel A Phase 1																
								0	0	0	0	0	0	0.00	0.00	0.00
Building Construction	45	17	0	10.8	7.3	20	394	17,730	6,698	0	191,484	48,895	0	7,278.80	3,382.96	0.00
Paving	15	0	0	10.8	7.3	20	42	630	0	0	6,804	0	0	258.64	0.00	0.00
Architectural Coating	9	0	0	10.8	7.3	20	45	405	0	0	4,374	0	0	166.27	0.00	0.00
Parcel A Phase 2																
											0	0	0	0.00	0.00	0.00
Building Construction	40	15	0	10.8	7.3	20	395	15,800	5,925	0	170,640	43,253	0	6,486.47	2,992.54	0.00
Paving	15	0	0	10.8	7.3	20	42	630	0	0	6,804	0	0	258.64	0.00	0.00
Architectural Coating	8	0	0	10.8	7.3	20	45	360	0	0	3,888	0	0	147.79	0.00	0.00
Parcel A Phase 3																
								0	0	0	0	0	0	0.00	0.00	0.00
Building Construction	50	19	0	10.8	7.3	20	393	19,650	7,467	0	212,220	54,509	0	8,067.03	3,771.36	0.00
Paving	15	0	0	10.8	7.3	20	43	645	0	0	6,966	0	0	264.80	0.00	0.00
Architectural Coating	10	0	0	10.8	7.3	20	44	440	0	0	4,752	0	0	180.64	0.00	0.00
Parcel A Phase 4																
								0	0	0	0	0	0	0.00	0.00	0.00
Building Construction	51	19	0	10.8	7.3	20	393	20,043	7,467	0	216,464	54,509	0	8,228.37	3,771.36	0.00
Paving	15	0	0	10.8	7.3	20	44	660	0	0	7,128	0	0	270.95	0.00	0.00
Architectural Coating	10	0	0	10.8	7.3	20	44	440	0	0	4,752	0	0	180.64	0.00	0.00
Parcel A Phase 5																
								0	0	0	0	0	0	0.00	0.00	0.00
Building Construction	42	16	0	10.8	7.3	20	392	16,464	6,272	0	177,811	45,786	0	6,759.06	3,167.80	0.00
Paving	15	0	0	10.8	7.3	20	44	660	0	0	7,128	0	0	270.95	0.00	0.00
Architectural Coating	8	0	0	10.8	7.3	20	44	352	0	0	3,802	0	0	144.51	0.00	0.00
Parcel B Phase 1																
								0	0	0	0	0	0	0.00	0.00	0.00
Building Construction	49	12	0	10.8	7.3	20	394	19,306	4,728	0	208,505	34,514	0	7,925.81	2,387.97	0.00
Paving	15	0	0	10.8	7.3	20	42	630	0	0	6,804	0	0	258.64	0.00	0.00
Architectural Coating	10	0	0	10.8	7.3	20	45	450	0	0	4,860	0	0	184.74	0.00	0.00
Parcel B Phase 2																
								0	0	0	0	0	0	0.00	0.00	0.00
Building Construction	24	6	0	10.8	7.3	20	394	9,456	2,364	0	102,125	17,257	0	3,882.03	1,193.99	0.00
Paving	10	0	0	10.8	7.3	20	42	420	0	0	4,536	0	0	172.43	0.00	0.00
Architectural Coating	5	0	0	10.8	7.3	20	45	225	0	0	2,430	0	0	92.37	0.00	0.00
Parcel C Phase 3																
								0	0	0	0	0	0	0.00	0.00	0.00
Building Construction	111	26	0	10.8	7.3	20	393	43,623	10,218	0	471,128	74,591	0	17,908.81	5,160.81	0.00
Paving	15	0	0	10.8	7.3	20	43	645	0	0	6,966	0	0	264.80	0.00	0.00
Architectural Coating	22	0	0	10.8	7.3	20	44	968	0	0	10,454	0	0	397.40	0.00	0.00
Parcel C Phase 4																
								0	0	0	0	0	0	0.00	0.00	0.00
Building Construction							220	0	0	0	0	0	0	0.00	0.00	0.00
Paving	75	17	0	10.8	7.3	20	44	3,300	748	0	35,640	5,460	0	1,354.77	377.79	0.00
Architectural Coating	13	0	0	10.8	7.3	20	44	572	0	0	6,178	0	0	234.83	0.00	0.00
Building Construction	15	0	0	10.8	7.3	20	120	1,800	0	0	19,440	0	0	738.96	0.00	0.00

Total Construction VMT
2,301,540

Total Fuel Consumption (gallons gasoline and diesel)
99,338

On-Site Construction Equipment Fuel Consumption Calculations
 AQ/GHG Appendix: CalEEMod Baumgardner Ranch Development Project

Baumgardner Ranch Development Project - All phases

		From CalEEMod								
CalEEMod Run	Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor	Number of Days	HP Hours	Diesel Fuel Usage	
Site work for the entire project site	Demolition	Concrete/Industrial Saws	1	8	81	0.73	29	13,718.16	685.91	
Site work for the entire project site	Demolition	Excavators	3	8	158	0.38	29	41,787.84	2,089.39	
Site work for the entire project site	Site Preparation	Rubber Tired Dozers	3	8	247	0.4	22	52,166.40	2,608.32	
Site work for the entire project site	Site Preparation	Tractors/Loaders/Backhoes	4	8	97	0.37	22	25,266.56	1,263.33	
Site work for the entire project site	Grading	Excavators	2	8	158	0.38	43	41,307.52	2,065.38	
Site work for the entire project site	Grading	Graders	1	8	187	0.41	43	26,374.48	1,318.72	
Site work for the entire project site	Grading	Rubber Tired Dozers	1	8	247	0.4	43	33,987.20	1,699.36	
Site work for the entire project site	Grading	Scrapers	2	8	367	0.48	43	121,198.08	6,059.90	
Site work for the entire project site	Grading	Tractors/Loaders/Backhoes	2	8	97	0.37	43	24,692.32	1,234.62	
Off-site	Site Preparation	Graders	1	8	187	0.41	1	613.36	30.67	
Off-site	Site Preparation	Tractors/Loaders/Backhoes	1	8	97	0.37	1	287.12	14.36	
Off-site	Grading	Concrete/Industrial Saws	1	8	81	0.73	2	946.08	47.30	
Off-site	Grading	Rubber Tired Dozers	1	1	247	0.4	2	197.60	9.88	
Off-site	Grading	Tractors/Loaders/Backhoes	2	6	97	0.37	2	861.36	43.07	
Off-site	Paving	Cement and Mortar Mixers	4	6	9	0.56	5	604.80	30.24	
Off-site	Paving	Pavers	1	7	130	0.42	5	1,911.00	95.55	
Off-site	Paving	Rollers	1	7	80	0.38	5	1,064.00	53.20	
Off-site	Paving	Tractors/Loaders/Backhoes	1	7	97	0.37	5	1,256.15	62.81	
Parcel A Phase 1	Building Construction	Cranes	1	0.8	231	0.29	394	21,115.25	1,055.76	
Parcel A Phase 1	Building Construction	Forklifts	1	2.64	89	0.2	394	18,514.85	925.74	
Parcel A Phase 1	Building Construction	Generator Sets	1	0.9	84	0.74	394	22,041.94	1,102.10	
Parcel A Phase 1	Building Construction	Tractors/Loaders/Backhoes	1	2.31	97	0.37	394	32,664.92	1,633.25	
Parcel A Phase 1	Building Construction	Welders	1	0.9	46	0.45	394	7,340.22	367.01	
Parcel A Phase 1	Paving	Cement and Mortar Mixers	1	8	9	0.56	42	1,693.44	84.67	
Parcel A Phase 1	Paving	Pavers	1	8	130	0.42	42	18,345.60	917.28	
Parcel A Phase 1	Paving	Paving Equipment	1	8	132	0.36	42	15,966.72	798.34	
Parcel A Phase 1	Paving	Rollers	2	8	80	0.38	42	20,428.80	1,021.44	
Parcel A Phase 1	Paving	Tractors/Loaders/Backhoes	1	8	97	0.37	42	12,059.04	602.95	
Parcel A Phase 1	Architectural Coating	Air Compressors	1	6	78	0.48	45	10,108.80	505.44	
Parcel A Phase 2	Building Construction	Cranes	1	0.8	231	0.29	395	21,168.84	1,058.44	
Parcel A Phase 2	Building Construction	Forklifts	1	2.64	89	0.2	395	18,561.84	928.09	
Parcel A Phase 2	Building Construction	Generator Sets	1	0.9	84	0.74	395	22,097.88	1,104.89	
Parcel A Phase 2	Building Construction	Tractors/Loaders/Backhoes	1	2.31	97	0.37	395	32,747.83	1,637.39	
Parcel A Phase 2	Building Construction	Welders	1	0.9	46	0.45	395	7,358.85	367.94	
Parcel A Phase 2	Paving	Cement and Mortar Mixers	1	8	9	0.56	42	1,693.44	84.67	
Parcel A Phase 2	Paving	Pavers	1	8	130	0.42	42	18,345.60	917.28	
Parcel A Phase 2	Paving	Paving Equipment	1	8	132	0.36	42	15,966.72	798.34	
Parcel A Phase 2	Paving	Rollers	2	8	80	0.38	42	20,428.80	1,021.44	
Parcel A Phase 2	Paving	Tractors/Loaders/Backhoes	1	8	97	0.37	42	12,059.04	602.95	
Parcel A Phase 2	Architectural Coating	Air Compressors	1	6	78	0.48	45	1,347.84	67.39	
Parcel A Phase 3	Building Construction	Cranes	1	2.64	231	0.29	393	69,503.46	3,475.17	
Parcel A Phase 3	Building Construction	Forklifts	1	0.9	89	0.2	393	6,295.86	314.79	
Parcel A Phase 3	Building Construction	Generator Sets	1	2.31	84	0.74	393	56,430.71	2,821.54	
Parcel A Phase 3	Building Construction	Tractors/Loaders/Backhoes	1	0.9	97	0.37	393	12,694.29	634.71	
Parcel A Phase 3	Building Construction	Welders	1	0.8	46	0.45	393	6,508.08	325.40	
Parcel A Phase 3	Paving	Cement and Mortar Mixers	1	8	9	0.56	43	1,733.76	86.69	
Parcel A Phase 3	Paving	Pavers	1	8	130	0.42	43	18,782.40	939.12	
Parcel A Phase 3	Paving	Paving Equipment	1	8	132	0.36	43	16,346.88	817.34	
Parcel A Phase 3	Paving	Rollers	2	8	80	0.38	43	20,915.20	1,045.76	
Parcel A Phase 3	Paving	Tractors/Loaders/Backhoes	1	8	97	0.37	43	12,346.16	617.31	
Parcel A Phase 3	Architectural Coating	Air Compressors	1	6	78	0.48	44	9,884.16	494.21	
Parcel A Phase 4	Building Construction	Cranes	1	0.8	231	0.29	393	21,061.66	1,053.08	
Parcel A Phase 4	Building Construction	Forklifts	1	2.64	89	0.2	393	18,467.86	923.39	
Parcel A Phase 4	Building Construction	Generator Sets	1	0.9	84	0.74	393	21,985.99	1,099.30	
Parcel A Phase 4	Building Construction	Tractors/Loaders/Backhoes	1	2.31	97	0.37	393	32,582.02	1,629.10	
Parcel A Phase 4	Building Construction	Welders	1	0.9	46	0.45	393	7,321.59	366.08	
Parcel A Phase 4	Paving	Cement and Mortar Mixers	1	8	9	0.56	44	1,774.08	88.70	
Parcel A Phase 4	Paving	Pavers	1	8	130	0.42	44	19,219.20	960.96	
Parcel A Phase 4	Paving	Paving Equipment	1	8	132	0.36	44	16,727.04	836.35	
Parcel A Phase 4	Paving	Rollers	2	8	80	0.38	44	21,401.60	1,070.08	
Parcel A Phase 4	Paving	Tractors/Loaders/Backhoes	1	8	97	0.37	44	12,633.28	631.66	
Parcel A Phase 4	Architectural Coating	Air Compressors	1	6	78	0.48	44	9,884.16	494.21	
Parcel A Phase 5	Building Construction	Cranes	1	0.8	231	0.29	392	21,008.06	1,050.40	
Parcel A Phase 5	Building Construction	Forklifts	1	2.64	89	0.2	392	18,420.86	921.04	
Parcel A Phase 5	Building Construction	Generator Sets	1	0.9	84	0.74	392	21,930.05	1,096.50	
Parcel A Phase 5	Building Construction	Tractors/Loaders/Backhoes	1	2.31	97	0.37	392	32,499.11	1,624.96	
Parcel A Phase 5	Building Construction	Welders	1	0.9	46	0.45	392	7,302.96	365.15	
Parcel A Phase 5	Paving	Cement and Mortar Mixers	1	8	9	0.56	44	1,774.08	88.70	
Parcel A Phase 5	Paving	Pavers	1	8	130	0.42	44	19,219.20	960.96	
Parcel A Phase 5	Paving	Paving Equipment	1	8	132	0.36	44	16,727.04	836.35	
Parcel A Phase 5	Paving	Rollers	2	8	80	0.38	44	21,401.60	1,070.08	
Parcel A Phase 5	Paving	Tractors/Loaders/Backhoes	1	8	97	0.37	44	12,633.28	631.66	
Parcel A Phase 5	Architectural Coating	Air Compressors	1	6	78	0.48	44	9,884.16	494.21	
Parcel B Phase 1	Building Construction	Cranes	1	0.8	231	0.29	394	21,115.25	1,055.76	
Parcel B Phase 1	Building Construction	Forklifts	1	2.64	89	0.2	394	18,514.85	925.74	
Parcel B Phase 1	Building Construction	Generator Sets	1	0.9	84	0.74	394	22,041.94	1,102.10	
Parcel B Phase 1	Building Construction	Tractors/Loaders/Backhoes	1	2.31	97	0.37	394	32,664.92	1,633.25	

Parcel B Phase 1	Building Construction	Welders	1	0.9	46	0.45	394	7,340.22	367.01
Parcel B Phase 1	Paving	Cement and Mortar Mixers	1	8	9	0.56	42	1,693.44	84.67
Parcel B Phase 1	Paving	Pavers	1	8	130	0.42	42	18,345.60	917.28
Parcel B Phase 1	Paving	Paving Equipment	1	8	132	0.36	42	15,966.72	798.34
Parcel B Phase 1	Paving	Rollers	2	8	80	0.38	42	20,428.80	1,021.44
Parcel B Phase 1	Paving	Tractors/Loaders/Backhoes	1	8	97	0.37	42	12,059.04	602.95
Parcel B Phase 1	Architectural Coating	Air Compressors	1	6	78	0.48	45	10,108.80	505.44
Parcel B Phase 2	Building Construction	Cranes	1	0.8	231	0.29	394	21,115.25	1,055.76
Parcel B Phase 2	Building Construction	Forklifts	1	2.64	89	0.2	394	18,514.85	925.74
Parcel B Phase 2	Building Construction	Generator Sets	1	0.9	84	0.74	394	22,041.94	1,102.10
Parcel B Phase 2	Building Construction	Tractors/Loaders/Backhoes	1	2.31	97	0.37	394	32,664.92	1,633.25
Parcel B Phase 2	Building Construction	Welders	1	0.9	46	0.45	394	7,340.22	367.01
Parcel B Phase 2	Paving	Cement and Mortar Mixers	4	6	9	0.56	42	5,080.32	254.02
Parcel B Phase 2	Paving	Pavers	1	6	130	0.42	42	13,759.20	687.96
Parcel B Phase 2	Paving	Rollers	1	7	80	0.38	42	8,937.60	446.88
Parcel B Phase 2	Paving	Tractors/Loaders/Backhoes	1	8	97	0.37	42	12,059.04	602.95
Parcel B Phase 2	Architectural Coating	Air Compressors	1	6	78	0.48	45	10,108.80	505.44
Parcel C Phase 3	Building Construction	Cranes	1	0.8	231	0.29	393	21,061.66	1,053.08
Parcel C Phase 3	Building Construction	Forklifts	1	2.64	89	0.2	393	18,467.86	923.39
Parcel C Phase 3	Building Construction	Generator Sets	1	0.9	84	0.74	393	21,985.99	1,099.30
Parcel C Phase 3	Building Construction	Tractors/Loaders/Backhoes	1	2.31	97	0.37	393	32,582.02	1,629.10
Parcel C Phase 3	Building Construction	Welders	1	0.9	46	0.45	393	7,321.59	366.08
Parcel C Phase 3	Paving	Cement and Mortar Mixers	1	8	9	0.56	43	1,733.76	86.69
Parcel C Phase 3	Paving	Pavers	1	8	130	0.42	43	18,782.40	939.12
Parcel C Phase 3	Paving	Paving Equipment	1	8	132	0.36	43	16,346.88	817.34
Parcel C Phase 3	Paving	Rollers	2	8	80	0.38	43	20,915.20	1,045.76
Parcel C Phase 3	Paving	Tractors/Loaders/Backhoes	1	8	97	0.37	43	12,346.16	617.31
Parcel C Phase 3	Architectural Coating	Air Compressors	1	0.8	78	0.48	44	1,317.89	65.89
Parcel C Phase 4	Building Construction	Cranes	1	2.64	231	0.29	220	38,907.79	1,945.39
Parcel C Phase 4	Building Construction	Forklifts	1	0.9	89	0.2	220	3,524.40	176.22
Parcel C Phase 4	Building Construction	Generator Sets	1	2.31	84	0.74	220	31,589.71	1,579.49
Parcel C Phase 4	Building Construction	Tractors/Loaders/Backhoes	1	0.9	97	0.37	220	7,106.22	355.31
Parcel C Phase 4	Building Construction	Welders	1	0.9	46	0.45	220	4,098.60	204.93
Parcel C Phase 4	Paving	Cement and Mortar Mixers	1	6	9	0.56	44	1,330.56	66.53
Parcel C Phase 4	Paving	Pavers	1	6	130	0.42	44	14,414.40	720.72
Parcel C Phase 4	Paving	Paving Equipment	1	8	132	0.36	44	16,727.04	836.35
Parcel C Phase 4	Paving	Rollers	1	7	80	0.38	44	9,363.20	468.16
Parcel C Phase 4	Paving	Tractors/Loaders/Backhoes	1	8	97	0.37	44	12,633.28	631.66
Parcel C Phase 4	Architectural Coating	Air Compressors	1	6	78	0.48	44	9,884.16	494.21

Total Construction Equipment Fuel Consumption 99,596.93 gallons

Notes:

Equipment assumptions are provided in the CalEEMod output files.

Fuel usage estimate of 0.05 gallons of diesel fuel per horsepower-hour is from the SCAQMD CEQA Air Quality Handbook, Table A9-3E.

South Coast Air Quality Management District. 1993. Air Quality Handbook, Table A9-3E.

Website: <http://www.aqmd.gov/home/rules-compliance/ceqa/air-quality-analysis-handbook>. Accessed April 18, 2019.

Construction Office Electricity Consumption Calculation

Energy Appendix: CalEEMod Construction Office Electricity

kWh/yr = kilowatt hours per year

5.3 Energy by Land

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Office Building	12837.6	2.8629	1.7000e-004	3.0000e-005	2.8775
Total		2.8629	1.7000e-004	3.0000e-005	2.8775

Phase Name	Phase Type	Start Date	End Date	Num Days	Week	Num Days
Demolition	Demolition	3/11/2020	4/20/2020	5	5	29
Site Preparation	Site Preparation	4/21/2020	5/20/2020	5	5	22
Grading	Grading	5/21/2020	7/20/2020	5	5	43
Building Construction	Building Construction	7/20/2020	1/20/2026	5	5	1970
Paving	Paving	1/20/2022	3/20/2026	5	5	237
Architectural Coating	Architectural Coating	3/20/2022	5/20/2026	5	5	222

Start of Construction	3/11/2020
End of Construction	5/20/2026
Number of Workdays	1616 (non-weekends)
Days	2261
Days in a year	365
Years of Construction	6.194520548

Time (years)	Electricity Use
1 year	12,837.60 kWh/yr
6.194520548	79,522.78 kWh/yr

Operation Vehicle Fuel Consumption Calculation

AQ/GHG Appendix: CalEEMod Baumgardner Ranch Development Project ANNUAL

VMT = Vehicle Miles Traveled
FE = Fuel Economy

Trip Summary Information

Land Use	Average Daily Trip Rate			Unmitigated Annual VMT	Mitigated Annual VMT
	Weekday	Saturday	Sunday		
Apartments Mid Rise	903.04	903.04	903.04	2,590,560	2,590,560
Condo/Townhouse High Rise	442.80	442.80	442.80	1,270,265	1,270,265
Other Asphalt Surfaces	0.00	0.00	0.00		
Other Non-Asphalt Surfaces	0.00	0.00	0.00		
Single Family Housing	745.76	745.76	745.76	2,139,369	2,139,369
Total	2,091.60	2,091.60	2,091.60	6,000,194	6,000,194

California Air Resource Board. 2019. EMFAC2014 Web Database. March. Website: <https://www.arb.ca.gov/emfac/2014/>. Accessed March 21, 2019

EMFAC2014 (v1.0.7) Emissions Inventory

Region Type: County

Region: Sonoma

Calendar Year: 2022

Season: Annual

Vehicle Classification: EMFAC2007 Categories

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

Given

Region	CalYr	VehClass	MdIYr	Speed	Fuel	Population	VMT	Fuel_Consumption	FE	VMT*FE
Sonoma	2022	HHDT	Aggregated	Aggregated	GAS	15.81606	1903.046	0.407845	4.666098	8879.79807
Sonoma	2022	HHDT	Aggregated	Aggregated	DSL	2030.516	254471.5	44.3162	5.742177	1461220.48
Sonoma	2022	LDA	Aggregated	Aggregated	GAS	129762	5181496	172.7982	29.98581	155371362
Sonoma	2022	LDA	Aggregated	Aggregated	DSL	1790.575	67918.19	1.841197	36.88807	2505371
Sonoma	2022	LDT1	Aggregated	Aggregated	GAS	10267.74	353086.3	14.22716	24.81776	8762809.64
Sonoma	2022	LDT1	Aggregated	Aggregated	DSL	22.55693	366.4488	0.01383	26.49739	9709.93819
Sonoma	2022	LDT2	Aggregated	Aggregated	GAS	37320.95	1571259	69.0689	22.74915	35744801.1
Sonoma	2022	LDT2	Aggregated	Aggregated	DSL	65.30978	3051.264	0.101469	30.07104	91754.6762
Sonoma	2022	LHDT1	Aggregated	Aggregated	GAS	3488.625	101413.2	10.58319	9.582479	971789.717
Sonoma	2022	LHDT1	Aggregated	Aggregated	DSL	4473.044	143272.3	8.327684	17.20434	2464904.51
Sonoma	2022	LHDT2	Aggregated	Aggregated	GAS	490.9107	17874.06	2.033675	8.789045	157095.948
Sonoma	2022	LHDT2	Aggregated	Aggregated	DSL	1103.693	41879.02	2.672712	15.66911	656206.915
Sonoma	2022	MCY	Aggregated	Aggregated	GAS	7359.37	48258.37	1.369875	35.22831	1700060.73
Sonoma	2022	MDV	Aggregated	Aggregated	GAS	29235.77	967735.2	59.24591	16.33421	15807190.2
Sonoma	2022	MDV	Aggregated	Aggregated	DSL	452.955	19299.55	0.851328	22.66994	437519.689
Sonoma	2022	MH	Aggregated	Aggregated	GAS	882.5126	7460.816	1.134693	6.575187	49056.2608
Sonoma	2022	MH	Aggregated	Aggregated	DSL	252.7231	2244.656	0.234511	9.571653	21485.0707
Sonoma	2022	MHDT	Aggregated	Aggregated	GAS	323.1311	15060.21	2.36535	6.367009	95888.4593
Sonoma	2022	MHDT	Aggregated	Aggregated	DSL	5161.596	264991.9	31.74676	8.347052	2211900.87
Sonoma	2022	OBUS	Aggregated	Aggregated	GAS	149.4559	7885.021	1.201316	6.563651	51754.5258
Sonoma	2022	OBUS	Aggregated	Aggregated	DSL	269.554	21181.79	2.90732	7.285675	154323.649
Sonoma	2022	SBUS	Aggregated	Aggregated	GAS	22.85643	1175.339	0.098381	11.94682	14041.5645
Sonoma	2022	SBUS	Aggregated	Aggregated	DSL	185.3812	7039.517	0.970259	7.255294	51073.7615
Sonoma	2022	UBUS	Aggregated	Aggregated	GAS	51.18753	7479.901	1.504529	4.971589	37186.9949
Sonoma	2022	UBUS	Aggregated	Aggregated	DSL	62.7305	9052.208	2.037546	4.442702	40216.2592

Calculations

Sum of VMT*FE (Column L) 228877604
Sum of VMT (Column H) 9116854.22
Weighted Average FE 25.104888 miles/gallon

Passenger vehicle VMT (CalEEMod output files) 6000194
Fuel consumption 239,005.01 gallons

Operation Natural Gas Consumption Calculation

AQ/GHG Appendix: CalEEMod Baumgardner Ranch Development Project

kBTU/yr = kilo-British Thermal Units/year

CF = cubic feet

Mitigated																	
	Natural Gas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Apartments Mid Rise	1.43415e+006	7.7300e-003	0.0661	0.0281	4.2000e-004		5.3400e-003	5.3400e-003		5.3400e-003	5.3400e-003	0.0000	76.5316	76.5316	1.4700e-003	1.4000e-003	76.9864
Condo/Townhouse High Rise	518367	2.8000e-003	0.0239	0.0102	1.5000e-004		1.9300e-003	1.9300e-003		1.9300e-003	1.9300e-003	0.0000	27.6620	27.6620	5.3000e-004	5.1000e-004	27.8264
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Single Family Housing	2.29614e+006	0.0124	0.1058	0.0450	6.8000e-004		8.5500e-003	8.5500e-003		8.5500e-003	8.5500e-003	0.0000	122.5309	122.5309	2.3500e-003	2.2500e-003	123.2590
Total		0.0229	0.1958	0.0833	1.2500e-003		0.0158	0.0158		0.0158	0.0158	0.0000	226.7246	226.7246	4.3500e-003	4.1600e-003	228.0719

Conversion from kBTU/yr to CF/yr

Abraxas. 2019. Energy Conversion Calculator.

Website: <https://www.abraxasenergy.com/energy-resources/toolbox/conversion-calculators/energy/>. Accessed March 11, 2019

Apartment Units Natural Gas 1,434,150 kBTU/yr
 Condo/Townhouse Natural Gas 518,367 kBTU/yr
 Single Family Homes Natural Gas 2,296,140 kBTU/yr
Total Operation Natural Gas 4,248,657 kBTU/yr

Operation Electricity Consumption Calculation

AQ/GHG Appendix: CalEEMod Baumgardner Ranch Development Project ANNUAL

kWh/yr = kilowatt hours per year

	Electricity Use		Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	tons/yr	MT/yr			
Apartments Mid Rise	585306		130.5284	7.70E-03	1.59E-03	131.1955
Condo/Townhouse High Rise	163281		36.413	2.15E-03	4.40E-04	36.5991
Other Asphalt Surfaces	-100000		-22.3009	-0.0013	-0.0003	-22.4149
Other Non-Asphalt Surfaces	-100000		-22.3009	-0.0013	-0.0003	-22.4149
Single Family Housing	539155		120.2363	7.09E-03	1.47E-03	120.8508
Total			242.5759	0.0143	2.96E-03	243.8157

Apartment Units Electricity 585306 kWh/yr
 Condo/Townhouse Electricity 163281 kWh/yr
 Single Family Homes Electricity 539155 kWh/yr
 "Other Asphalt Surfaces" - Solar Panels -200,000 kWh/yr
 Total Operation Electricity **1,087,742 kWh/yr**

Typical Construction Trailer - Sonoma-North Coast County, Annual

**Typical Construction Trailer
Sonoma-North Coast County, Annual**

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Office Building	0.72	1000sqft	0.02	720.00	0

1.2 Other Project Characteristics

Urbanization	Urban	Wind Speed (m/s)	2.2	Precipitation Freq (Days)	75
Climate Zone	4			Operational Year	2020
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	491.65	CH4 Intensity (lb/MWhr)	0.029	N2O Intensity (lb/MWhr)	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Typical construction trailer for estimate of energy usage

CO2 intensity factor adjusted based on Renewable Portfolio Standard

(Sonoma Clean Power is not available as an option in CalEEMod)

Land Use - 12'x60' single-wide unit (720 sq ft)

Construction Phase - Typical construction trailer for energy use estimates - estimates would be included in the operational component of the results

Off-road Equipment - Zeroed out construction equipment

Vehicle Trips - Zeroed out off-site trips

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	5.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	UsageHours	6.00	0.00
tblProjectCharacteristics	CO2IntensityFactor	641.35	491.65
tblVehicleTrips	ST_TR	2.46	0.00
tblVehicleTrips	SU_TR	1.05	0.00
tblVehicleTrips	WD_TR	11.03	0.00

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

4.2 Trip Summary Information

Land Use	Average Daily Trip Rate			Unmitigated	Mitigated
	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
General Office Building	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

Land Use	Miles			Trip %			Trip Purpose %		
	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
General Office Building	9.50	7.30	7.30	33.00	48.00	19.00	77	19	4

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
General Office Building	0.568926	0.041373	0.172015	0.112977	0.030659	0.007080	0.028564	0.025868	0.003029	0.001930	0.005517	0.000872	0.001190

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	2.8629	2.8629	1.7000e-004	3.0000e-005	2.8775
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	2.8629	2.8629	1.7000e-004	3.0000e-005	2.8775
NaturalGas Mitigated	6.0000e-005	5.8000e-004	4.9000e-004	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005	0.0000	0.6290	0.6290	1.0000e-005	1.0000e-005	0.6327
NaturalGas Unmitigated	6.0000e-005	5.8000e-004	4.9000e-004	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005	0.0000	0.6290	0.6290	1.0000e-005	1.0000e-005	0.6327

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Office Building	12837.6	2.8629	1.7000e-004	3.0000e-005	2.8775
Total		2.8629	1.7000e-004	3.0000e-005	2.8775

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Office Building	12837.6	2.8629	1.7000e-004	3.0000e-005	2.8775
Total		2.8629	1.7000e-004	3.0000e-005	2.8775