

**Appendix D:
Energy Supporting Information**

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Alexander Valley Wellness Center Project Summary Energy Use

Summary of Energy Use During Construction

Construction off-site vehicle fuel	30,329 gallons (gasoline, diesel)
Construction on-site equipment fuel	28,393 gallons (diesel)
Construction office electricity	27,504 kilowatt hours

Summary of Energy Use During Operations

(Annually)

Operation vehicle fuel	73,645 gallons (gasoline, diesel)
Operation natural gas	779,850 kilo-British Thermal Units
Operation electricity	849,403 kilowatt hours

Construction Vehicle Fuel Calculations

California Air Resource Board (ARB). 2019. EMFAC2014 Web Database. Website: <https://www.arb.ca.gov/emfac/2014/>. Accessed July 11, 2019.

VMT = Vehicle Miles Traveled
FE = Fuel Economy

EMFAC2014 (v1.0.7) Emissions Inventory

Region Type: Sub-Area

Region: Sonoma (NC)

Calendar Year: 2019

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

<i>Given</i>									<i>Calculations</i>	
Region	CalYr	VehClass	MdlYr	Speed	Fuel	Population	VMT	Fuel_Consumption (1000 gallons/day)	FE (mi/gallon)	VMT*FE
Sonoma (NC)	2019	LDA	Aggregated	Aggregated	GAS	21479.53554	980354.6136	39.65271043	24.72352	24237817.74
Sonoma (NC)	2019	LDA	Aggregated	Aggregated	DSL	371.5108588	15111.86803	0.503837376	29.99354	453258.4643
Sonoma (NC)	2019	LDT1	Aggregated	Aggregated	GAS	2602.901185	78591.05376	4.05411613	19.3855	1523526.592
Sonoma (NC)	2019	LDT1	Aggregated	Aggregated	DSL	6.820606804	126.7426037	0.005739723	22.08166	2798.68667
Sonoma (NC)	2019	LDT2	Aggregated	Aggregated	GAS	6325.849103	257543.0252	14.30287351	18.00638	4637418.474
Sonoma (NC)	2019	LDT2	Aggregated	Aggregated	DSL	8.893359019	426.6270329	0.017321799	24.62949	10507.60518
Sonoma (NC)	2019	MDV	Aggregated	Aggregated	GAS	5812.279213	197402.5349	14.84825204	13.29466	2624400.548
Sonoma (NC)	2019	MDV	Aggregated	Aggregated	DSL	78.4788974	3433.441863	0.187559727	18.30586	62852.10153
Sonoma (NC)	2019	LHDT1	Aggregated	Aggregated	GAS	936.1643232	28122.40848	2.979090358	9.439931	265473.6056
Sonoma (NC)	2019	LHDT1	Aggregated	Aggregated	DSL	1289.939673	43349.61494	2.55343381	16.97699	735945.889
Sonoma (NC)	2019	LHDT2	Aggregated	Aggregated	GAS	97.67250315	3581.466603	0.415487052	8.619924	30871.96813
Sonoma (NC)	2019	LHDT2	Aggregated	Aggregated	DSL	281.8706348	10720.5754	0.703418659	15.24068	163388.809
Sonoma (NC)	2019	MHDT	Aggregated	Aggregated	GAS	94.45332357	3939.042893	0.649528845	6.064462	23888.1753
Sonoma (NC)	2019	MHDT	Aggregated	Aggregated	DSL	678.0870386	27899.84008	3.438167104	8.114742	226400.0129
Sonoma (NC)	2019	HHDT	Aggregated	Aggregated	GAS	2.912787558	254.6881985	0.056975409	4.470143	1138.492547
Sonoma (NC)	2019	HHDT	Aggregated	Aggregated	DSL	394.392734	50866.74244	8.972061153	5.66946	288386.9651
									Worker Trips	
									Sum of VMT*FE	33552580.22
									Total VMT	1532989.907
									Weighted Average FE	21.88701965 miles/gallon
									Vendor	
									Sum of VMT*FE	1735493.918
									Total VMT	168734.379
									Weighted Average FE	10.2853605 miles/gallon
									Haul	
									Sum of VMT*FE	289525.4576
									Total VMT	51121.43064
									Weighted Average FE	5.66348504 miles/gallon

Construction Assumptions

Source: AQ/GHG Appendix

Trips and VMT	Trips per Day		Total Trips	Trips per Day			Num Days	Trips per Phase			VMT per Phase			Fuel Consumption (gallons)		
	Worker	Vendor		Worker	Vendor	Hauling		Worker	Vendor	Hauling	Worker	Vendor	Hauling	Worker	Vendor	Hauling
	Trip	Trip	Trip	Trip	Length	Length	Length	Trip	Trip	Trip	Trips	Trips	Trips	Trips	Trips	Trips
Phase Name	Number	Number	Number	Length	Length	Length	Num Days	Number	Number	Number	Trips	Trips	Trips	Trips	Trips	Trips
Site Preparation	8	0	0	10.8	7.3	20	15	120	0	0	1,296	0	0	59.21	0.00	0.00
Rough Grading	10	0	1,325	10.8	7.3	20	15	150	0	1,325	1,620	0	26,500	74.02	0.00	4,679.10
Site Grading	10	0	0	10.8	7.3	20	20	200	0	0	2,160	0	0	98.69	0.00	0.00
Building Construction	61	26	0	10.8	7.3	20	520	31,720	13,520	0	342,576	98,696	0	15,652.02	9,595.77	0.00
Paving	15	0	0	10.8	7.3	20	15	225	0	0	2,430	0	0	111.02	0.00	0.00
Architectural Coating	12	0	0	10.8	7.3	20	10	120	0	0	1,296	0	0	59.21	0.00	0.00

Total Construction VMT (miles)

476,574

Total Fuel Consumption (gallons)

30,329

Construction Equipment Fuel Calculation

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor	Number of Days	HP Hours	Diesel Fuel Usage
Site Preparation	Graders	1	8.0	187	0.41	15	9,200.40	460.02
Site Preparation	Scrapers	1	8.0	367	0.48	15	21,139.20	1,056.96
Site Preparation	Tractors/Loaders/Backhoes	1	7.0	97	0.37	15	3,768.45	188.42
Rough Grading	Graders	1	8.0	187	0.41	15	9,200.40	460.02
Rough Grading	Rubber Tired Dozers	1	8.0	247	0.40	15	11,856.00	592.80
Rough Grading	Tractors/Loaders/Backhoes	2	7.0	97	0.37	15	7,536.90	376.85
Site Grading	Graders	1	8.0	187	0.41	20	12,267.20	613.36
Site Grading	Rubber Tired Dozers	1	8.0	247	0.40	20	15,808.00	790.40
Site Grading	Tractors/Loaders/Backhoes	2	7.0	97	0.37	20	10,049.20	502.46
Building Construction	Cranes	1	3.4	231	0.29	520	118,438.32	5,921.92
Building Construction	Forklifts	2	3.0	89	0.20	520	55,536.00	2,776.80
Building Construction	Generator Sets	1	3.4	84	0.74	520	109,898.88	5,494.94
Building Construction	Tractors/Loaders/Backhoes	1	2.5	97	0.37	520	46,657.00	2,332.85
Building Construction	Welders	3	3.4	46	0.45	520	109,792.80	5,489.64
Paving	Cement and Mortar Mixers	1	8.0	9	0.56	15	604.80	30.24
Paving	Pavers	1	8.0	130	0.42	15	6,552.00	327.60
Paving	Paving Equipment	1	8.0	132	0.36	15	5,702.40	285.12
Paving	Rollers	2	8.0	80	0.38	15	7,296.00	364.80
Paving	Tractors/Loaders/Backhoes	1	8.0	97	0.37	15	4,306.80	215.34
Architectural Coating	Air Compressors	1	6.0	78	0.48	10	2,246.40	112.32
Total Construction Equipment Fuel Consumption								28,392.86 gallons

Notes:

Equipment assumptions are consistent with those used to estimate GHG emissions (see 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 Schedule

Phase Name	Phase Type	Start Date	End Date	Working Days per Week	Total Construction Days
Site Preparation	Site Preparation	12/1/2019	12/20/2019	5	15
Rough Grading	Grading	12/21/2019	1/10/2020	5	15
Site Grading	Grading	1/11/2020	2/7/2020	5	20
Building Construction	Building Construction	1/11/2020	1/7/2022	5	520
Paving	Paving	2/8/2020	2/28/2020	5	15
Architectural Coating	Architectural Coating	1/8/2022	1/21/2022	5	10

Construction Office Electricity Calculation

Energy Appendix: CalEEMod Typical Construction Trailer

kWh/yr = kilowatt hours per year

Energy by Land Use - Electricity

Annual 12,837.6 kWh/yr

Total Over Construction 27,504.118 kWh

Total Construction Schedule

Start 12/1/2019

End 1/21/2022

Total Days 782

Years 2.14

Operation Fuel Calculation

California Air Resource Board (ARB). 2019. EMFAC2014 Web Database. Website: <https://www.arb.ca.gov/emfac/2014/>. Accessed July 11, 2019.

EMFAC2014 (v1.0.7) Emissions Inventory

Region Type: Sub-Area

Region: Sonoma (NC)

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

VMT = Vehicle Miles Traveled
FE = Fuel Economy

Given

Calculations

Region	CalYr	VehClass	MdlYr	Speed	Fuel	Population	VMT	Fuel Consumption	FE	VMT*FE
Sonoma (NC)	2022	HHDT	Aggregated	Aggregated	GAS	2.40807399	308.343485	0.06477533	4.7602	1467.776542
Sonoma (NC)	2022	HHDT	Aggregated	Aggregated	DSL	404.429093	53222.9794	9.02674706	5.896142	313810.2255
Sonoma (NC)	2022	LDA	Aggregated	Aggregated	GAS	22690.9393	1044309.33	38.7375264	26.9586	28153113.54
Sonoma (NC)	2022	LDA	Aggregated	Aggregated	DSL	380.287642	15521.852	0.47748906	32.50724	504572.5885
Sonoma (NC)	2022	LDT1	Aggregated	Aggregated	GAS	2044.18029	64677.3825	3.05623835	21.16241	1368729.57
Sonoma (NC)	2022	LDT1	Aggregated	Aggregated	DSL	4.96300701	91.3178623	0.00397567	22.96916	2097.494458
Sonoma (NC)	2022	LDT2	Aggregated	Aggregated	GAS	5929.35674	249228.323	12.4773155	19.97451	4978214.822
Sonoma (NC)	2022	LDT2	Aggregated	Aggregated	DSL	10.4529957	483.068539	0.01812119	26.65766	12877.47491
Sonoma (NC)	2022	LHDT1	Aggregated	Aggregated	GAS	744.592181	21278.4201	2.24424726	9.481317	201747.45
Sonoma (NC)	2022	LHDT1	Aggregated	Aggregated	DSL	1091.88229	34651.4118	2.02473456	17.11405	593026.0482
Sonoma (NC)	2022	LHDT2	Aggregated	Aggregated	GAS	80.1203163	2958.47775	0.33769967	8.760677	25918.26833
Sonoma (NC)	2022	LHDT2	Aggregated	Aggregated	DSL	239.047989	8876.68892	0.57180153	15.52407	137802.3694
Sonoma (NC)	2022	MCY	Aggregated	Aggregated	GAS	1216.55798	9366.4095	0.28870318	32.44304	303874.8213
Sonoma (NC)	2022	MDV	Aggregated	Aggregated	GAS	5161.33295	175392.171	12.2482227	14.31981	2511581.844
Sonoma (NC)	2022	MDV	Aggregated	Aggregated	DSL	86.6163598	3632.63344	0.18384614	19.7591	71777.55173
Sonoma (NC)	2022	MH	Aggregated	Aggregated	GAS	177.697237	1470.40701	0.22632132	6.496989	9553.217626
Sonoma (NC)	2022	MH	Aggregated	Aggregated	DSL	49.9266645	451.782583	0.04772356	9.466657	4276.870803
Sonoma (NC)	2022	MHDT	Aggregated	Aggregated	GAS	83.7308841	3876.34555	0.61860945	6.266224	24290.05065
Sonoma (NC)	2022	MHDT	Aggregated	Aggregated	DSL	761.473929	30249.2458	3.69784811	8.180229	247445.7703
Sonoma (NC)	2022	OBUS	Aggregated	Aggregated	GAS	16.2464795	1196.09715	0.17890191	6.685771	7996.831207
Sonoma (NC)	2022	OBUS	Aggregated	Aggregated	DSL	22.1547606	1947.61745	0.2561734	7.602731	14807.21142
Sonoma (NC)	2022	SBUS	Aggregated	Aggregated	GAS	5.39630622	338.657751	0.02850937	11.87882	4022.854774
Sonoma (NC)	2022	SBUS	Aggregated	Aggregated	DSL	23.4249407	885.202578	0.12221257	7.243139	6411.644897
Sonoma (NC)	2022	UBUS	Aggregated	Aggregated	GAS	4.54773029	846.95995	0.16768219	5.050983	4277.98058
Sonoma (NC)	2022	UBUS	Aggregated	Aggregated	DSL	2.97370016	553.815812	0.11914003	4.648444	2574.381996

Vehicles	
Sum of VMT*FE	39506268.66
Total VMT	1725814.942
Weighted Average FE	22.89137016 miles/gallon

Total VMT (CalEEMod output files)

	VMT	Fuel Consumption
Vehicles	1,685,842.00	73,645.31
Total	1,685,842.00	73,645.31

Total VMT	1,685,842
Fuel consumption	73,645.31 gallons per year

Source of VMT: AQ/GHG Appendix, CalEEMod Outputs

Operation Natural Gas Use

Source: AQ/GHG Appendix, CalEEMod Output

kBTU/yr = kilo-British Thermal Units/year

CF = cubic feet

	kBTU/yr
Medical Office Building	779,850

Total 779,850 kBTU/yr

Conversion from kBTU/yr to CF/yr

Abraxas. 2019. Energy Conversion Calculator.

Website: <https://www.abraxasenergy.com/energy-resources/toolbox/conversion-calculators/energy/>. Accessed May 1, 2019.

Equivalency:

779,850 kBTU/yr

3,149,647 CF/yr natural gas

Operation Electricity Use

Source: AQ/GHG Appendix, CalEEMod Output

kWh/yr = kilowatt hours per year

	Electricity Use (kWh/yr)
Land Use	
Medical Office Building	849,403.00 kWh/yr
Total	849,403 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	2019		
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MW hr)	491.65	CH4 Intensity (lb/MW hr)	0.029	N2O Intensity (lb/MW hr)	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

2.0 Emissions Summary

2.2 Overall Operational

Unmitigated Operational

	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					
Area	3.6500e-003	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.0000e-005	1.0000e-005	0.0000	0.0000	1.0000e-005
Energy	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	3.4919	3.4919	1.8000e-004	5.0000e-005	3.5102
Mobile	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
Waste						0.0000	0.0000		0.0000	0.0000	0.1360	0.0000	0.1360	8.0400e-003	0.0000	0.3369
Water						0.0000	0.0000		0.0000	0.0000	0.0406	0.2156	0.2562	4.1800e-003	1.0000e-004	0.3909
Total	3.7100e-003	5.8000e-004	5.0000e-004	0.0000	0.0000	4.0000e-005	4.0000e-005	0.0000	4.0000e-005	4.0000e-005	0.1766	3.7075	3.8841	0.0124	1.5000e-004	4.2381

Mitigated Operational

	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					
Area	3.6500e-003	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.0000e-005	1.0000e-005	0.0000	0.0000	1.0000e-005
Energy	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	3.4919	3.4919	1.8000e-004	5.0000e-005	3.5102
Mobile	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
Waste						0.0000	0.0000		0.0000	0.0000	0.1360	0.0000	0.1360	8.0400e-003	0.0000	0.3369
Water						0.0000	0.0000		0.0000	0.0000	0.0406	0.2156	0.2562	4.1800e-003	1.0000e-004	0.3909
Total	3.7100e-003	5.8000e-004	5.0000e-004	0.0000	0.0000	4.0000e-005	4.0000e-005	0.0000	4.0000e-005	4.0000e-005	0.1766	3.7075	3.8841	0.0124	1.5000e-004	4.2381

	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
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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

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