# Appendix E Energy Calculations

# Construction Energy Worksheets

## 656 San Vicente Project

### **Construction Energy Analysis**

#### **Fuel Consumption Summary**

Category	Value
Diesel fuel for heavy-duty construction equipment (gal)	219,874
Diesel fuel for Haul Trucks (gal)	12,104
Diesel fuel for Vendor Trucks (gal)	17,609
Gasoline fuel for workers (gal)	172,298
Electricity for heavy-duty construction equipment (MWh)	1,063
Water Conveyance for Dust Control (MWh)	2
Construction Office (MWh)	13
Total Diesel Consumption	249,587
Total Gasoline Consumption	172,298
Total Electricity Consumption	1,078
Construction Phase Duration (years)	2.8
Annual Average Gallons Diesel	88,446
Annual Average Gallons Gasoline	61,057
Annual Average Electricity	382

Source	Diesel (gal)	Gas (gal)	Electricity (MWh)
Off-Road Equipment	219,874	-	1,063
Haul/Vendor	29,712	-	-
Worker	-	172,298	-
Water Conveyance for Dust Control	-	-	2.3
Construction Office	-	-	13
Total Project Energy Consumption	249,587	172,298	1,078
Annual Average Gallons Diesel	88,446	-	
Annual Average Gallons Gasoline	-	61,057	
Annual Average Electricity	-	-	382
Los Angeles County Fuel Consumption	1	State Fuel	Consumption
Diesel	Gas	Diesel	Gas
475,000,000	3,169,000,000	3,337,500,000	13,475,000,000
0.019%	0.0019%	0.0027%	0.0005%

1. California Energy Commission, California Retail Fuel Outlet Annual Reporting (CEC-A15) Results, 2018 https://ww2.energy.ca.gov/almanac/transportation\_data/gasoline/2010-2018\_A15\_Results.xlsx Diesel is adjusted to account for retail (48%) and non-retail (52%) diesel sales.

### 656 San Vicente Project **Construction Energy Analysis**

## **Off-Road Equipment**

<u>Equipment ≤ 100 HP</u>		
	Parameter	Value
pounds diesel fuel/hp-hr (lb/hp-hr): <sup>1</sup>		0.41
diesel fuel density (lb/gal): <sup>1</sup>		7.11
diesel gallons/hp-hr (gal/hp-hr):		0.06
Total hp-hr :		3,585,807
Total diesel consumption (gal):		205,800

#### Equipment > 100 HP Parameter Value pounds diesel fuel/hp-hr (lb/hp-hr):1 0.37 diesel fuel density (lb/gal):<sup>1</sup> diesel gallons/hp-hr (gal/hp-hr): 7.11 0.05 Total hp-hr: 272,629 Total diesel gallons: 14,075

## Total diesel gallons (off-road equipment):

1. 2017 Off-road Diesel Emission Factors, cells B30 and B31

Subphase	Equipment	# of Equipment	Hours/ Day	НР	Load Factor	Days	Total hp-hr
Demolition	Concrete/Industrial Saws	1	8	81	0.73	25	11,826
Demolition	Crawler Tractors	1	1 8 212 0.43			25	18,232
Demolition	Excavators	2	8	158	0.38	25	24,016
Demolition	Rough Terrain Forklifts	1	8	100	0.40	25	8,000
Demolition	Rubber Tired Dozers	2	8	255	0.40	25	40,800
Demolition	Skid Steer Loaders	1	8	65	0.37	25	4,810
Demolition	Tractors/Loaders/Backhoes	1	8	97	0.37	25	7,178
Site Preparation	Rough Terrain Forklifts	1	8	100	0.40	6	1,920
Site Preparation	Skid Steer Loaders	1	8	65	0.37	6	1,154
Site Preparation	Tractors/Loaders/Backhoes	3	8	97	0.37	6	5,168
Grading	Bore/Drill Rigs	2	8	221	0.50	27	47,736
Grading	Excavators	2	8	158	0.38	27	25,937
Grading	Plate Compactors	1	8	8	0.43	27	743
Grading	Rough Terrain Forklifts	1	8	100	0.40	27	8,640
Grading	Rubber Tired Loaders	1	8	203	0.36	27	15,785
Grading	Skid Steer Loaders	1	8	65	0.37	27	5,195
Grading	Tractors/Loaders/Backhoes	3	6	97	0.37	27	17,443
Drainage/Utilities/Sub-Grade	Excavators	1	8	158	0.38	19	9,126
Drainage/Utilities/Sub-Grade	Other Construction Equipment	1	8	172	0.42	19	10,980
Drainage/Utilities/Sub-Grade	Rough Terrain Forklifts	1	8	100	0.40	19	6,080
Drainage/Utilities/Sub-Grade	Skid Steer Loaders	1	8	65	0.37	19	3,656
Drainage/Utilities/Sub-Grade	Tractors/Loaders/Backhoes	2	8	97	0.37	19	10,911
Building Construction	Aerial Lifts	1	8	63	0.31	782	122,180
Building Construction	Air Compressors	1	8	78	0.48	782	234,225
Building Construction	Cement and Mortar Mixers	1	8	9	0.56	782	31,530
Building Construction	Concrete/Industrial Saws	4	8	81	0.73	782	1,479,669
Building Construction	Forklifts	3	6	89	0.20	782	250,553
Building Construction	Generator Sets	3	8	84	0.74	782	1,166,619
Building Construction	Rough Terrain Forklifts	1	8	100	0.40	782	250,240
Foundations	Cement and Mortar Mixers	4	8	9	0.56	156	25,160
Foundations	Forklifts	2	6	89	0.20	156	33,322
Foundations	Skid Steer Loaders	1	8	65	0.37	156	30,014
Foundations	Tractors/Loaders/Backhoes	2	8	97	0.37	156	89,581
Architectural Coating	Air Compressors	1	8	78	0.48	102	30,551
Paving	Pavers	2	8	125	0.42	50	42,000
Paving	Paving Equipment	2	8	132	0.36	50	38,016
Paving	Rollers	2	8	80	0.38	50	24,320
Paving	Rough Terrain Forklifts	1	8	100	0.40	50	16,000
						Total ≤ 100	3,585,807
						Total >100	272,629

219,874

#### 656 San Vicente Project

### Construction Energy Analysis Off-Road Equipment - Electric

#### 1,063.20 Total MWh

2.82 years

377	average annual MWh									
Phase Name	Equipment	Number	Hours/Day	НР	кw	Load	Days	Total kWh	Fuel Type	kW/hp
Building Construction	Cranes	1	8	226	169	0.29	782	305,751	Electric	0.7457
Building Construction	Welders	6	8	46	34	0.45	782	579,405	Electric	
Foundations	Cranes	1	8	231	172	0.29	156	62,343	Electric	
Foundations	Pumps	2	8	84	63	0.74	156	115,696	Electric	
								1,063,195		
							Total MWh	1,063		

#### **Construction Energy Analysis**

<b>Temporary Construction Trailer - Electricity</b>			Total k/M/b			
Land Use	Square Feet	Title 24 Electricity Non-Title 24 Electricity Lighting Elect				
General Office	1,000	4.60	4.62	3.77	12,990	13

Assumptions and Sources:

-CalEEMod 2016.3.2 default emission factors used to estimate energy use for temporary construction office

-Construction offices assumed to total 5,000 square feet

#### Construction Energy Analysis Construction Water Energy Estimates

Source	Acres	Construction Water Use per Day (Mgal)	Days of Water Use	Total Construction Water Use (Mgal)	Total Electricity Demand from Water Demand (MWh)
Project Site	0.76	0.00228	77	0.176	2.3
CalEEMod Water Electricity Factors		Electricity Intensity Factor To Supply (kWh/Mgal)	Electricity Intensity Factor To Treat (kWh/Mgal)	Electricity Intensity Factor To Distribute (kWh/Mgal)	Electricity Intensity Factor For Wastewater Treatment (kWh/Mgal)
#REF!		9727	111	1272	1911

Sources and Assumptions:

-Electricity Intensity Factors - California Emissions Estimator Model (CalEEMod).

-Estimated construction water use assumed to be generally equivalent to landscape irrigation, based on a factor of 20.94 gallons per year per square foot of

landscaped area within the Los Angeles area (Mediterranean climate), which assumes high water demand landscaping materials and an irrigation system efficiency of 85%.

Factor is therefore (20.94 GAL/SF/year) x (43,560 SF/acre) / (365 days/year) / (0.85) = 2,940 gallons/acre/day, rounded up to 3,000 gallons/acre/day.

(U.S. Department of Energy, Energy Efficiency & Renewable Energy, Federal Energy Management Program. "Guidelines for Estimating Unmetered Landscaping Water Use."

July 2010. Page 12, Table 4 - Annual Irrigation Factor – Landscaped Areas with High Water Requirements).

#### 656 San Vicente

#### **Total On-Road Fuel Consumption**

	gal/mile	gal/min
2020Hauling Hauling	0.15925199	1.51441E-05
2020Vendor Vendor	0.1298909	9.15757E-06
2020Worker Worker	0.03844702	1.94905E-06
2021Hauling Hauling	0.15613658	1.50968E-05
2021Vendor Vendor	0.12720883	9.12128E-06
2021Worker Worker	0.03742093	2.06198E-06
2022Hauling Hauling	0.15194685	1.49226E-05
2022Vendor Vendor	0.12346263	8.98135E-06
2022Worker Worker	0.03636982	2.00421E-06
2023Hauling Hauling	0.14312318	1.42709E-05
2023Vendor Vendor	0.11698571	8.58941E-06
2023Worker Worker	0.03532451	1.94677E-06

Source	Fuel Type	Total Fuel Use (gal)
Hauling	Diesel	12,104
Vendor	Diesel	17,609
Worker	Gasoline	172,298
Fuel Type	Total Fuel Use	Annual Fuel Use
Diesel	29,712	10,529

Gasoline	172,298	61,057

Duration of Construction2.8years

	Daily	Haul Days	Work Hours	One-Way				Regiona	al Emissions
Construction Phase	One-Way	per Phase	per Day	Trip Distance	Idling			(ga	allons)
	Trips			per Day	per Day				
		(days)	(hours/day)	(miles)	(minutes)	gal/mile	gal/min	gal/day	Total Gallons
Demolition	2021	·							
Total Haul Trips	300								
Hauling	12	25	8	20	15	0.16	1.51E-05	37	937
Vendor	6	25	8	6.9	15	0.13	9.12E-06	5	132
Worker	20	25	8	14.7	0	0.04	2.06E-06	11	275
Site Preparation	2021								
Total Haul Trips	0								
Hauling	0	6	8	20	15	0.16	1.51E-05	0	0
Vendor	6	6	8	6.9	15	0.13	9.12E-06	5	32
Worker	10	6	8	14.7	0	0.04	2.06E-06	6	33
Grading	2021								
Total Haul Trips	2460								
Hauling	92	27	8	20	15	0.16	1.51E-05	287	7,757
Vendor	6	27	8	6.9	15	0.13	9.12E-06	5	142
Worker	20	27	8	14.7	0	0.04	2.06E-06	11	297
Drainage/Utilities/Sub-Grade	2021								
Total Haul Trips	0								
Hauling	0	19	8	20	15	0.16	1.51E-05	0	0
Vendor	6	19	8	6.9	15	0.13	9.12E-06	5	100
Worker	10	19	8	14.7	0	0.04	2.06E-06	6	105
Building Construction	2021								
Total Haul Trips	0								
Hauling	0	233	8	20	15	0.16	1.51E-05	0	0
Vendor	26	233	8	6.9	15	0.13	9.12E-06	23	5,317
Worker	400	233	8	14.7	0	0.04	2.06E-06	220	51,268
Building Construction	2022								
Total Haul Trips	0								
Hauling	0	313	8	20	15	0.15	1.49E-05	0	0
Vendor	26	313	8	6.9	15	0.12	8.98E-06	22	6,933
Worker	400	313	8	14.7	0	0.04	2.00E-06	214	66,936

#### 656 San Vicente

#### **Total On-Road Fuel Consumption**

	gal/mile	gal/min
2020Hauling Hauling	0.15925199	1.51441E-05
2020Vendor Vendor	0.1298909	9.15757E-06
2020Worker Worker	0.03844702	1.94905E-06
2021Hauling Hauling	0.15613658	1.50968E-05
2021Vendor Vendor	0.12720883	9.12128E-06
2021Worker Worker	0.03742093	2.06198E-06
2022Hauling Hauling	0.15194685	1.49226E-05
2022Vendor Vendor	0.12346263	8.98135E-06
2022Worker Worker	0.03636982	2.00421E-06
2023Hauling Hauling	0.14312318	1.42709E-05
2023Vendor Vendor	0.11698571	8.58941E-06
2023Worker Worker	0.03532451	1.94677E-06

Source	Fuel Type	Total Fuel Use (gal)
Hauling	Diesel	12,104
Vendor	Diesel	17,609
Worker	Gasoline	172,298
Fuel Type	Total Fuel Use	Annual Fuel Use
Diesel	29 712	10 529
DICSCI	23,712	10,525

Diesel	29,/12	10,529
Gasoline	172,298	61,057

Duration of Construction2.8years

	Daily	Haul Days	Work Hours	One-Way				Regiona	l Emissions
Construction Phase	One-Way	per Phase	per Day	Trip Distance	Idling			(ga	allons)
	Trips			per Day	per Day		., .		
		(days)	(hours/day)	(miles)	(minutes)	gal/mile	gal/min	gal/day	Total Gallons
Building Construction	2023								
Total Haul Trips	0								
Hauling	0	236	8	20	15	0.14	1.43E-05	0	0
Vendor	26	236	8	6.9	15	0.12	8.59E-06	21	4,953
Worker	400	236	8	14.7	0	0.04	1.95E-06	208	49,019
<u>Foundations</u>	2021								
Total Haul Trips	1000								
Hauling	7	156	8	20	15	0.16	1.51E-05	22	3,410
Vendor	0	156	8	6.9	15	0.13	9.12E-06	0	0
Worker	30	156	8	14.7	0	0.04	2.06E-06	17	2,574
Paving	2023								
Total Haul Trips	0								
Hauling	0	50	8	20	15	0.14	1.43E-05	0	0
Vendor	0	50	8	6.9	15	0.12	8.59E-06	0	0
Worker	20	50	8	14.7	0	0.04	1.95E-06	10	519
Architectural Coating	2023								
Total Haul Trips	0								
Hauling	0	102	8	20	15	0.14	1.43E-05	0	0
Vendor	0	102	8	6.9	15	0.12	8.59E-06	0	0
Worker	24	102	8	14.7	0	0.04	1.95E-06	12	1,271
Vendor Worker <u>Architectural Coating</u> Total Haul Trips Hauling Vendor Worker	0 2023 0 0 0 24	50 50 102 102 102	8 8 8 8 8	6.9 14.7 20 6.9 14.7	15 0 15 15 0	0.12 0.04 0.14 0.12 0.04	8.59E-06 1.95E-06 1.43E-05 8.59E-06 1.95E-06	0 10 0 12	0 519 0 1,271

# **Operational Energy Worksheets**

## 656 San Vicente Project

Energy Use Summary Net Annual Electricity Usage

	Total Electricity	Total Natural	<b>Total Gasoline</b>	Total Diesel
	Demand	Gas Demand	Demand	Demand
Source	(MWh/yr)	(cf/yr)	(gallons/yr)	(gallons/yr)
Existing Uses	174	107,048	30,581	2,967
Project				
Medical Office Building	1,754	1,396,274	-	-
Restaurant	173	889,305	-	-
Retail	13	1,573	-	-
Parking	252	0	-	-
Total Building Energy - Buildout	2,191	2,287,153	-	-
Water	205	-	-	-
EV Charging	114	-	-	-
Emergency Generators	-	-	-	771
Mobile Sources	-	328,788.3	318,902	32,818
Project Total	2,511	2,615,940.8	318,902	33,589
Net Total (Project Buildout - Existing)	2,337	2,508,892	288,321	30,623
Electricity Use (LADWP)/Natural Gas Use(SoCalGas)/County Gasoline Use/County Diesel Use	26,245,000	################	3,169,000,000	475,000,000
% of SCE/SoCalGas/County Total	0.01%	0.0002%	0.009%	0.006%
Southern California Edison, 2018 Financial and Statistical Report, 2nd page of report.				
2018 Financial and Statistical Report				
California Gas and Electric Utilities, 2019. 2019 California Gas Report Supplement, pg. 26				
https://www.socalgas.com/regulatory/documents/cgr/2019_CGR_Supplement_7-1-19.pdf				
Conversion factor of 1,036 Btu per cubic foot based on United States Energy Information Administration data				
https://www.eia.gov/tools/fags/fag.php?id=45.8t=8				

https://www.eia.gov/tools/faqs/faq.php?id=45&t=8

California Air Resources Board, CalEEMod, Version 2016.3.2.

CEC, Gas Consumption by Entity

http://www.ecdms.energy.ca.gov/gasbyutil.aspx

#### 656 San Vicente Operational Energy Analysis Energy and VMT Estimates

Source Existing Uses	Natural Gas demand (cf/yr)	Electricity demand (MWh/yr)	Electricity demand from water demand (MWh/yr)	Total Electricity Demand (MWh)
Elementary School	65 300	<i>A</i> 1	1	<i>4</i> 1
Rotail	14 449	131	1	132
Existing Uses - Total	79.750	172	2	174
Project Uses				-/ .
Medical Office Building	1.396.274	1.754	167	1.921
Restaurant	889,305	173	38	211
Retail	1,573	13	0	13
Parking	0	252	0	252
Project Uses - Total	2,287,153	2,191	205	2,396
Net Total	2,207,403	2,020	203	2,223
	CalEEMod		Total Water Use	Electricity Demand from water Demand
	Indoor Water Use			
Source	(Mgal/yr)	Outdoor Water Use (Mgal/yr)	(Mgal/yr)	(MWh)
Existing Uses				
Elementary School	0.1	0	0.1	1
Retail	0.1	0	0.1	1
Existing Uses - Total	0.1	0.0	0.1	2
Project Uses				
Medical Office Building	13	0	13	166.70
Restaurant	3	0	3	38
Retail	0	0	0	0
Parking	0	0	0	0
Project Uses - Total	16	0	16	205
CalEEMod Water Electricity Facto	Electricity Intensity Factor To Supply (kWh/Mgal)	Electricity Intensity Factor To Treat (kWh/Mgal)	Electricity Intensity Factor To Distribute (kWh/Mgal)	Electricity Intensity Factor For Wastewater Treatment (kWh/Mgal)
South Coast	9,727	111	1,272	1,911

Source: California Emissions Estimator Model (CalEEMod).

1. Southern California Edison, 2018 Financial and Statistical Report, 2nd page of report.

2018 Financial and Statistical Report

- 2. California Gas and Electric Utilities, 2019. 2019 California Gas Report Supplement, pg. 26 https://www.socalgas.com/regulatory/documents/cgr/2019 CGR Supplement 7-1-19.pdf
- 3. Conversion factor of 1,036 Btu per cubic foot based on United States Energy Information Administration data https://www.eia.gov/tools/faqs/faq.php?id=45&t=8
- 4. California Air Resources Board, CalEEMod, Version 2016.3.2.
- 5. CEC, Gas Consumption by Entity http://www.ecdms.energy.ca.gov/gasbyutil.aspx

#### 656 San Vicente Operational Energy Analysis Project Trips Fuel Usage from VMT

Annual VMT (All):

8,914,030 miles/year

(With trip and VMT reductions from land use characteristics and proximity to public transit.)

Fuel Type: <sup>1</sup>	GAS	DSL	ELEC	NG	
Percent:	94.28%	3.99%	1.64%	0.1%	-
Miles per Gallon Fuel:	26.35	10.83	-	3.42	
Annual VMT by Fuel Type :	8,404,145	355,321	146,488	8,076	miles/year
Annual Fuel Usage :	318,902	32,818	-	2,360 328,788	gal/year MMcf/year
Annual Fuel Savings from Electric Vehicles: <sup>2</sup>	-	-	5,559		gal/year (assumed t

#### Notes:

- 1. California Air Resources Board, EMFAC2014 (Los Angeles County; Annual; 2023, Aggregate Fleet).
- California Energy Commission, California Retail Fuel Outlet Annual Reporting (CEC-A15) Results, 2018. Available at: http://www.energy.ca.gov/almanac/transportation\_data/gasoline/piira\_retail\_survey.html. Accessed March 2019. Diesel is adjusted to account for retail (48%) and non-retail (52%) diesel sales

VMT Source: ESA 2020, EMFAC2017, Gibson Transportation Consulting, INC.

#### 656 San Vicente Operational Energy Analysis Existing Trips Fuel Usage from VMT

Annual VMT (All):

778,180 miles/year

(With trip and VMT reductions from land use characteristics and proximity to public transit.)

Fuel Type:1	GAS	DSL	ELEC	NG	
Percent:	95.31%	3.65%	0.95%	0.1%	-
Miles per Gallon Fuel:	24.25	9.58	-	3.46	
Annual VMT by Fuel Type :	741,682	28,419	7,402	677	miles/year
Annual Fuel Usage :	30,581	2,967	-	196 27,299	gal/year MMBtu/yr
Annual Fuel Savings from Electric Vehicles: <sup>2</sup>	-	-	305		gal/year (assumed t

#### Notes:

- 1. California Air Resources Board, EMFAC2014 (Los Angeles County; Annual; 2023, Aggregate Fleet).
- California Energy Commission, California Retail Fuel Outlet Annual Reporting (CEC-A15) Results, 2018. Available at: http://www.energy.ca.gov/almanac/transportation\_data/gasoline/piira\_retail\_survey.html. Accessed March 2019. Diesel is adjusted to account for retail (48%) and non-retail (52%) diesel sales

VMT Source: ESA 2020, EMFAC2017, Gibson Transportation Consulting, INC.

#### **Operational Energy Analysis**

Energy Use Summary

Location	Spaces <sup>1</sup>	Days	Number of Charge Hours per Day	EV Charging Capacity (KW) <sup>2</sup>	MWh/yr
Non-Residential	21	365	4	3.75	114
Total	21				114

Sources and Assumptions:

<sup>1</sup> Number of spaces equal to 5% of the Project's total parking spaces and is based on City of Los Angeles' Code Ordinances requiring a minimum of 5% of parking spaces be EV charging station equipped in non-residential land uses

<sup>2</sup> EV Station charge rate based on fuel economy of an EV vehicle of 0.25 kWh/mile and conservative assumption of 50% Battery Electric Vehicle (BEV) and 50% Plug-in Hybrid Electric Vehicle (PHEV) where BEV mileage per hour of charge is 20 miles and PHEV mileage per hour charge is 10 miles. U.S Department of Energy, 2016, Benefits and Considerations of Electricity as a Vehicle Fuel, http://www.afdc.energy.gov/fuels/electricity\_benefits.html. CARB, Electric Vehicle (EV) Charging Infrastruture: Multifamily Building Standards.

	Total CO <sub>2</sub>	Fuel	Factor		Total	Total
	MT/yr	Туре	KGCO₂/gal	Gallons	Diesel (gal)	Gas (gal)
Emergency Generator	8	diesel	10.15	771		
Assumptions 10.15	diesel	KgCO2/ga	llon <sup>1</sup>			

8.91 gasoline KgCO2/gallon<sup>1</sup>

1 MT = 1,000 kilograms