

Appendix E: Energy Supporting Information

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Appendix E: Energy Consumption Calculations

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Fresno SEDA Specific Plan Energy Consumption Summay

Summary of Energy Use During Construction

Construction vehicle fuel	294,072,433 gallons (gasoline, diesel)
Construction equipment fuel	861,427 gallons (diesel)
Total construction fuel	294,933,859 gallons (gasoline, diesel)

Summary of Energy Use During Operations

(Annually)

Operation vehicle fuel	57,483,614 gallons (gasoline, diesel)
Operation natural gas	1,200,642,400 kilo-British Thermal Units
Operation electricity	500,083,800 kilowatt hours

Construction Vehicle Fuel Calculations

California Air Resource Board (ARB). 2022. EMFAC2021 Web Database. Website: <https://arb.ca.gov/emfac/emissions-inventory/>

VMT = Vehicle Miles Traveled

FE = Fuel Economy

Source: EMFAC2017 (v1.0.3) Emissions Inventory

Region Type: Sub-Area

Region: Fresno (SJV)

Calendar Year: 2024

Season: Annual

Vehicle Classification: EMFAC2007 Categories

Units: miles/day for CVMT and EVMT, trips/day for Trips, kWh/day for Energy Consumption, tons/day for Emissions, 1000 gallons/day for Fuel Consumption

CalYr	VehClass	MdlYr	Speed	Fuel	Population	VMT (mi/day)	Fuel Consumption	FE (mi/gallon)	VMT*FE
2024	HHDT	Aggregate	Aggregate	Gasoline	0.91779018	69.44543	0.018035207	3.85054799	267.4029615
2024	HHDT	Aggregate	Aggregate	Diesel	14420.401	2065363.2	343.6885277	6.00940385	12411601.32
2024	LDA	Aggregate	Aggregate	Gasoline	315119.581	12133467	410.3671735	29.5673441	358754405.4
2024	LDA	Aggregate	Aggregate	Diesel	708.812072	21074.605	0.474386501	44.4249678	936238.6519
2024	LDT1	Aggregate	Aggregate	Gasoline	30596.8039	993295.81	40.64748998	24.4368301	24273000.87
2024	LDT1	Aggregate	Aggregate	Diesel	18.8924069	217.86161	0.00859385	25.3508733	5522.981979
2024	LDT2	Aggregate	Aggregate	Gasoline	145366.063	5656654	237.1886608	23.8487538	134904147.8
2024	LDT2	Aggregate	Aggregate	Diesel	375.227507	15817.53	0.461913662	34.2434776	541647.2392
2024	LHDT1	Aggregate	Aggregate	Gasoline	12363.7564	442604.91	46.68025073	9.48163097	4196616.427
2024	LHDT1	Aggregate	Aggregate	Diesel	11041.7401	396666.76	25.1163181	15.7931891	6264633.159
2024	LHDT2	Aggregate	Aggregate	Gasoline	2053.92887	70185.222	8.437278009	8.31846745	583833.4885
2024	LHDT2	Aggregate	Aggregate	Diesel	4082.41606	149342.53	11.38052244	13.1226431	1959768.77
2024	MHDT	Aggregate	Aggregate	Gasoline	939.877494	52454.034	11.171826	4.69520682	246282.5359
2024	MHDT	Aggregate	Aggregate	Diesel	7764.57127	374754.48	43.22629384	8.66959549	3248969.765

Worker	
Sum of VMT*FE (Column BI)	519414963
Total VMT	18820527.18
Weighted Average FE	27.59832166
Vendor	
Sum of VMT*FE (Column BI)	28911972.87
Total VMT	3551440.55
Weighted Average FE	8.140914219
Haul	
Sum of VMT*FE (Column BI)	12411868.72
Total VMT	2065432.606
Weighted Average FE	6.00933126

Fresno SEDA Construction Assumptions

CalEEMod output file: Fresno SEDA EIR Project - Fresno County, Annual

Time stamp: Date: 6/22/2022 9:53 AM

Construction Schedule	Phase Name	Phase Type	Start Date	End Date	Num Days	
					Week	Num Days
1	Demolition	Demolition	1/1/2024	3/28/2025	5	325
2	Site Preparation	Site Preparation	1/1/2024	9/27/2024	5	195
3	Grading	Grading	1/1/2024	12/4/2025	5	504
4	Building Construction	Building Construction	1/1/2024	4/30/2043	5	5044
5	Paving	Paving	1/1/2024	5/14/2025	5	358
6	Architectural Coating	Architectural Coating	1/1/2024	5/14/2025	5	358

Trips and VMT	Phase Name	Trips per Day		Total Trips	Hauling Trip				Num Days	Worker Trip Number	Trips per Phase		VMT per Phase			Fuel Consumption (gallons)		
		Worker Trip Number	Vendor Trip Number		Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Vendor Ve			Vendor Trip Number	Hauling Trip Number	Worker Trips	Vendor Trips	Hauling Trips	Worker Trips	Vendor Trips	Hauling Trips
	Demolition	15	0	0	10.8	7.3	20	HDT_Mix	325	4,875	0	0	52,650	0	0	1,907.72	0	0
	Site Preparation	18	0	0	10.8	7.3	20	HDT_Mix	195	3,510	0	0	37,908	0	0	1,373.56	0	0
	Grading	20	0	0	10.8	7.3	20	HDT_Mix	504	10,080	0	0	108,864	0	0	3,944.59	0	0
	Building Construction	81,695	28,857	0	10.8	7.3	20	HDT_Mix	5044	412,069,580	145,554,708	0	4,450,351,464	1,062,549,368	0	161,254,424.06	130,519,662	0
	Paving	15	0	0	10.8	7.3	20	HDT_Mix	358	5,370	0	0	57,996	0	0	2,101.43	0	0
	Architectural Coating	16,339	0	0	10.8	7.3	20	HDT_Mix	358	5,849,362	0	0	63,173,110	0	0	2,289,019.98	0	0

Total Construction VMT (miles)
5,576,331,360

Total Fuel Consumption (gallons)
294,072,433

Construction Equipment Fuel Calculation

Source: AQ/GHG Appendix, CalEEMod Output

CalEEMod output file: Fresno SEDA EIR Project - Fresno County, Annual

Time stamp: Date: 6/22/2022 9:53 AM

Construction Schedule	Phase Name	Phase Type	Start Date	End Date	Week	Num Days
1	Demolition	Demolition	1/1/2024	3/28/2025	5	325
2	Site Preparation	Site Preparation	1/1/2024	9/27/2024	5	195
3	Grading	Grading	1/1/2024	12/4/2025	5	504
4	Building Construction	Building Construction	1/1/2024	4/30/2043	5	5044
5	Paving	Paving	1/1/2024	5/14/2025	5	358
6	Architectural Coating	Architectural Coating	1/1/2024	5/14/2025	5	358

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor	Number of		Diesel Fuel Usage
						Days	HP Hours	
Demolition	Concrete/Industrial Saws	1	8	81	0.73	325	153,738.00	7,686.90
Demolition	Excavators	3	8	158	0.38	325	468,312.00	23,415.60
Demolition	Rubber Tired Dozers	2	8	247	0.4	325	513,760.00	25,688.00
Site Preparation	Rubber Tired Dozers	3	8	247	0.4	195	462,384.00	23,119.20
Site Preparation	Tractors/Loaders/Backhoes	4	8	97	0.37	195	223,953.60	11,197.68
Grading	Excavators	2	8	158	0.38	504	484,162.56	24,208.13
Grading	Graders	1	8	187	0.41	504	309,133.44	15,456.67
Grading	Rubber Tired Dozers	1	8	247	0.4	504	398,361.60	19,918.08
Grading	Scrapers	2	8	367	0.48	504	1,420,554.24	71,027.71
Grading	Tractors/Loaders/Backhoes	2	8	97	0.37	504	289,416.96	14,470.85
Building Construction	Cranes	1	7	231	0.29	5044	2,365,282.92	118,264.15
Building Construction	Forklifts	3	8	89	0.2	5044	2,154,796.80	107,739.84
Building Construction	Generator Sets	1	8	84	0.74	5044	2,508,280.32	125,414.02
Building Construction	Tractors/Loaders/Backhoes	3	7	97	0.37	5044	3,801,612.36	190,080.62
Building Construction	Welders	1	8	46	0.45	5044	835,286.40	41,764.32
Paving	Pavers	2	8	130	0.42	358	312,748.80	15,637.44
Paving	Paving Equipment	2	8	132	0.36	358	272,194.56	13,609.73
Paving	Rollers	2	8	80	0.38	358	174,131.20	8,706.56
Architectural Coating	Air Compressors	1	6	78	0.48	358	80,421.12	4,021.06
Construction Equipment Fuel Consumption								861,426.54 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>.

Proposed Operation Fuel Calculation

California Air Resource Board (ARB). 2022. EMFAC2017 Web Database. Website: <https://arb.ca.gov/emfac/emissions-inventory/>

EMFAC2017 (v1.0.2) Emissions Inventory

Region Type: Sub-Area

Region: Fresno (SJV)

Calendar Year: 2050

Season: Annual

Vehicle Classification: EMFAC2007 Categories

Units: miles/day for CVMT and EVMT, trips/day for Trips, kWh/day for Energy Consumption, tons/day for Emissions, 1000 gallons/day for Fuel Consumption

VMT = Vehicle Miles Traveled

FE = Fuel Economy

				<i>Calculations</i>					
VehClass	Mdlyr	Speed	Fuel	Population	VMT	Fuel Consumption	FE	VMT*FE	
HHDT	Aggregate	Aggregate	Gasoline	0.547520258	73.5775311	0.01540365	4.776628119	351.4525037	
HHDT	Aggregate	Aggregate	Diesel	22780.13858	3317991.82	441.275833	7.519088005	24948272.51	
LDA	Aggregate	Aggregate	Gasoline	363760.0234	13416342.7	362.360818	37.02481624	496737622.7	
LDA	Aggregate	Aggregate	Diesel	216.3062587	7696.4367	0.13093681	58.77977935	452394.8509	
LDT1	Aggregate	Aggregate	Gasoline	24441.91598	844225.746	26.2251993	32.19139489	27176804.35	
LDT1	Aggregate	Aggregate	Diesel	0.284540036	10.1540355	0.00032368	31.37017096	318.5338293	
LDT2	Aggregate	Aggregate	Gasoline	206433.5203	7418001.16	239.327545	30.9951835	229922307.3	
LDT2	Aggregate	Aggregate	Diesel	784.2897761	28371.2066	0.66885118	42.4178163	1203444.629	
LHDT1	Aggregate	Aggregate	Gasoline	7053.009382	240784.45	21.1034534	11.4097179	2747282.649	
LHDT1	Aggregate	Aggregate	Diesel	4580.738918	148715.357	8.81688613	16.86710648	2508397.763	
LHDT2	Aggregate	Aggregate	Gasoline	783.9246594	25857.9138	2.55851666	10.10660364	261335.6861	
LHDT2	Aggregate	Aggregate	Diesel	2308.178293	70768.0209	4.92973066	14.35535242	1015899.88	
MCY	Aggregate	Aggregate	Gasoline	15761.46212	83384.6669	1.88567158	44.22014306	3687281.9	
MDV	Aggregate	Aggregate	Gasoline	121298.2348	4160498.73	162.368687	25.62377513	106607683.9	
MDV	Aggregate	Aggregate	Diesel	1345.471474	45198.6379	1.39298274	32.44737821	1466577.299	
MH	Aggregate	Aggregate	Gasoline	891.5037125	9372.88384	2.12198506	4.417035733	41400.36285	
MH	Aggregate	Aggregate	Diesel	572.9639183	5280.97511	0.56695188	9.314679516	49190.59067	
MHDT	Aggregate	Aggregate	Gasoline	395.6809075	21185.3325	3.82276607	5.541885663	117406.6902	
MHDT	Aggregate	Aggregate	Diesel	7521.075076	374812.899	37.1110007	10.09977883	3785527.383	
OBUS	Aggregate	Aggregate	Gasoline	99.89947806	3774.40795	0.67794282	5.56744293	21013.80088	
OBUS	Aggregate	Aggregate	Diesel	181.4603963	14328.6835	1.90775701	7.510748711	107619.1414	
SBUS	Aggregate	Aggregate	Gasoline	51.62781783	2892.94516	0.25044913	11.5510291	33416.49371	
SBUS	Aggregate	Aggregate	Diesel	384.7959335	8117.4784	0.88391726	9.183527381	74547.08513	
UBUS	Aggregate	Aggregate	Gasoline	19.76618879	244.455468	0.02421446	10.09543472	2467.884224	
UBUS	Aggregate	Aggregate	Diesel	1.474041067	19.1001764	0.00124365	15.35811837	293.3427694	
				Vehicles					
				Sum of VMT*FE				902,968,858	
				Total VMT				30,247,950	
				Weighted Average FE				29.85223349 miles/gallon	

Total VMT

Source: AQ/GHG Appendix, CalEEMod Output

Fresno SEDA EIR Project - Fresno County, Annual

Date: 6/22/2022 9:53 AM

Land Use	Average Daily Trip Rate			Unmitigated	Mitigated
	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
City Park	580.32	1,458.24	1629.36	1,826,580	1,826,580
Condo/Townhouse	123,751.92	137,614.84	106169.68	360,995,596	360,995,596
Government Office Building	179,511.89	0.00	0.00	219,886,731	219,886,731
Office Park	48,966.15	7,254.24	3361.72	91,458,957	91,458,957
Parking Lot	0.00	0.00	0.00		
Regional Shopping Center	169,215.13	206,733.82	94581.17	287,389,365	287,389,365
Research & Development	32,631.03	5,506.12	3216.74	61,538,401	61,538,401
Single Family Housing	239,379.52	241,915.32	216810.90	692,918,651	692,918,651
Total	794,035.96	600,482.59	425,769.57	1,716,014,281	1,716,014,281

	Annual VMT	Fuel	
	(miles)	Consumption	
Total VMT	1,716,014,281	57,483,614	gallons per year

Operation Natural Gas Use

Source: AQ/GHG Appendix, CalEEMod Output

Fresno SEDA EIR Project - Fresno County, Annual

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Land Use	Natural Gas Use	
City Park	-	kBTU/yr
Condo/Townhouse	281,092,000	kBTU/yr
Government Office Building	102,669,000	kBTU/yr
Office Park	99,790,100	kBTU/yr
Parking Lot	-	kBTU/yr
Regional Shopping Center	47,559,500	kBTU/yr
Research & Development	59,987,800	kBTU/yr
Single Family Housing	609,544,000	
Total	1,200,642,400	kBTU/yr

kBTU/yr = kilo-British Thermal Units/year

Operation Electricity Use

Source: AQ/GHG Appendix, CalEEMod Output
Fresno SEDA EIR Project - Fresno County, Annual
Date: 6/22/2022 9:53 AM

Project Electricity Use

Land Use	Electricity Use
City Park	0 kWh/yr
Condo/Townhouse	83,610,800 kWh/yr
Government Office Building	70,247,200 kWh/yr
Office Park	49,850,800 kWh/yr
Parking Lot	33,718,000 kWh/yr
Regional Shopping Center	35,501,600 kWh/yr
Research & Development	24,951,400 kWh/yr
Single Family Housing	202,204,000 kWh/yr
Total	500,083,800 kWh/yr

kWh/yr = kilowatt-hours per year