

Appendix B

Energy Calculations

Construction Fuel Consumption- Year 1

Phase Name	Off-road Equipment Type	Amount	Usage Hours	Horsepower	Load Factor	Number of days	Diesel Fuel Usage
Site Preparation	Graders	1	24	187	0.41	2	184
Site Preparation	Rubber Tired Dozers	1	24	247	0.4	2	237
Site Preparation	Tractors/Loaders/Backhoes	1	24.00	97	0.37	2	86
Grading	Bore/Drill Rigs	1	24.00	221	0.50	4	530
Grading	Graders	1	24.00	187	0.41	4	368
Grading	Rubber Tired Dozers	1	24.00	247	0.40	4	474
Grading	Tractors/Loaders/Backhoes	1	24.00	97	0.37	4	172
Building Construction	Cranes	1	6.00	231	0.29	187	3,758
Building Construction	Forklifts	1	6.00	89	0.20	187	999
Building Construction	Generator Sets	1	8.00	84	0.74	187	4,650
Building Construction	Tractors/Loaders/Backhoes	1	6.00	97	0.37	187	2,013
						TOTAL	13,051

Phase Name	Daily Worker Trip	Daily Vendor Trip	Daily Hauling Trip	Days per Year	Total Worker Trips	Total Vendor Trips	Total Haul Trips	Worker Trip Length (miles)	Vendor Trip Length (miles)	Haul Trip Length (miles)	Total Worker Trip Length (miles)	Total Vendor Trip Length (miles)	Total Haul Trip Length (miles)	Total gallons of gasoline	Total gallons of diesel
Site Preparation	8	0	0	2	16	0	0	10.80	7.30	20.00	172.8	0	—	6	0
Grading	10	0	0	4	40	0	0	10.80	7.30	20.00	432.00	0.00	—	15	0
Building Construction	20	8	0	187	3,740	1,496	0	10.80	7.30	20.00	40,392.00	10,920.80	—	1,443	2,070
													TOTAL	1,464	2,070

Construction Fuel Consumption– Year 2

Phase Name	Off-road Equipment Type	Amount	Usage Hours	Horsepower	Load Factor	Number of days	Diesel Fuel Usage
Building Construction	Cranes	1	6	231	0.29	13	261
Building Construction	Forklifts	1	6	89	0.2	13	69
Building Construction	Generator Sets	1	8.00	84	0.74	13	323
Building Construction	Tractors/Loaders/Backhoes	1	6.00	97	0.37	13	140
Paving	Cement and Mortar Mixers	1	6.00	9	0.56	10	15
Paving	Pavers	1	6.00	130	0.42	10	164
Paving	Paving Equipment	1	8.00	132	0.36	10	190
Paving	Rollers	1	7.00	80	0.38	10	106
Paving	Tractors/Loaders/Backhoes	1	8.00	97	0.37	10	144
Architectural Coating	Air Compressors	1	6.00	78	0.48	10	112
						TOTAL	1,194

Phase Name	Daily Worker Trip	Daily Vendor Trip	Daily Haul Trip	Days per Year	Total Worker Trips	Total Vendor Trips	Total Haul Trips	Worker Trip Length (miles)	Vendor Trip Length (miles)	Haul Trip Length (miles)	Total Worker Trip Length (miles)	Total Vendor Trip Length (miles)	Total Haul Trip Length (miles)	Total gallons of gasoline	Total gallons of diesel
Building Construction	20	8	0	13	260	104	0	10.80	7.30	20.00	2808	759.2	-	100	144
Paving	13	0	0	10	130	0	0	10.80	7.30	20.00	1,404.00	0.00	-	50	0
Architectural Coating	4	0	0	10	40	0	0	10.80	7.30	20.00	432.00	0.00	-	15	0
													TOTAL	166	144

EMFAC Input for Construction Calculations

Source: EMFAC2017 (v1.0.3) Emissions Inventory

Region Type: County

Region: Sacramento

Calendar Year: 2021

Season: Annual

Vehicle Classification: EMFAC2011 Categories

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

Region	CalYr	VehClass	MdYr	Speed miles/hr	Fuel	Population vehicles	VMT miles/day	Trips trips/day	Fuel gas 1,000 gallons/day	Diesel gas 1,000 gallons/day	Miles per gallon	Gasoline miles per gallon	Diesel miles per gallon
Sacramento	2021	LDA	Aggregated	Aggregated	GAS	582,044	20,975,476	2,717,495	680.4	3.79	30.83	28.00	5.28
Sacramento	2021	LDT1	Aggregated	Aggregated	GAS	63,649	2,117,867	288,476	80.7	0.18	26.25		
Sacramento	2021	LDT2	Aggregated	Aggregated	GAS	204,601	7,087,055	945,088	294.1	1.14	24.09		
Sacramento	2021	T7 tractor construction	Aggregated	Aggregated	DSL	259	17,975	1,170	0.00	3.41	5.28		

Operational – Fuel Consumption (Sacramento Region, 2023 CalYr)

Veh Class	Class	MdYr	Speed	Fuel	Population	VMT (mi/day)	Trips	Fuel Consumption (1,000 gal/day)	Fuel (gal/day)	mi/gal	CO ₂ RUNEX (tons/day)	CO ₂ (lb/day)	% of vehicle class EMFAC	% vehicle class CalEEMod	% vehicle class project	VMT by project vehicle class (mi/yr)	Gallons of fuel
HHDT	Truck	Aggregated	Aggregated	GAS	4.126049466	370.9548753	82.55399772	0.082755756	82.75575574	4.482526587	0.779803242	1,560	0.000446496	0.047186	2.10684E-05	1.263216351	0.281809004
HHDT	Truck	Aggregated	Aggregated	DSL	10487.52962	830442.7384	79463.17464	128.4708834	128470.8834	6.464054083	1338.471368	2,676,943	0.999553504	0.047186	0.047164932	2827.914972	437.4831855
LDA	Passenger	Aggregated	Aggregated	GAS	606308.3182	21470907.57	2835871.384	665.4181032	665418.1032	32.26679206	6133.406628	12,266,813	0.968028954	0.546645	0.529168187	31727.86618	983.2978167
LDA	Passenger	Aggregated	Aggregated	DSL	5931.129271	213255.1918	27679.16982	4.088383615	4088.383615	52.16124804	45.87348068	91,747	0.00961474	0.546645	0.00525585	315.1302369	6.041462748
LDA	Passenger	Aggregated	Aggregated	ELEC	11992.87168	495863.451	59658.61958	0	0	#DIV/0!	0	0	0.022356306	0.546645	0.012220963	732.7444901	0
LDT1	Truck	Aggregated	Aggregated	GAS	65368.82489	2148247.633	297348.0731	77.95506082	77955.06082	27.5575134	717.3326593	1,434,665	0.988741705	0.03589	0.03548594	2127.665978	77.20819898
LDT1	Truck	Aggregated	Aggregated	DSL	171.8027759	2906.858044	624.5733541	0.132639767	132.6397673	21.91543383	1.488277123	2,977	0.001337896	0.03589	4.80171E-05	2.879008392	0.131368989
LDT1	Truck	Aggregated	Aggregated	ELEC	520.3596655	21554.13651	2582.693036	0	0	#DIV/0!	0	0	0.009920399	0.03589	0.000356043	21.34763341	0
LDT2	Truck	Aggregated	Aggregated	GAS	210187.0401	7110545.533	970164.8507	277.9033637	277903.3637	25.58639607	2557.200925	5,114,402	0.993106042	0.197836	0.196472127	11780.07578	460.4038706
LDT2	Truck	Aggregated	Aggregated	DSL	1241.047612	49360.09086	6058.386505	1.285363939	1285.363939	38.4016459	14.4223545	28,845	0.006893958	0.197836	0.001363873	81.77510547	2.129468765
LDT2	Truck	Aggregated	Aggregated	ELEC	2017.989173	64372.67262	10165.33975	0	0	#DIV/0!	0	0	0.106659193	0.197836	0.021101028	1265.175445	#DIV/0!
LHDT1	Truck	Aggregated	Aggregated	GAS	16570.84786	539163.4195	246880.9426	64.08642368	64086.42368	8.413067676	599.7352697	1,199,471	0.893340807	0.020769	0.018553795	1112.448454	132.2286348
LHDT1	Truck	Aggregated	Aggregated	DSL	14242.93915	481067.9853	179158.2569	26.45912717	26459.12717	18.18155158	294.7439568	589,488	0.865591917	0.020769	0.017977479	1077.893657	59.28502043
LHDT2	Truck	Aggregated	Aggregated	GAS	2262.201873	74699.66463	33703.43723	10.13554171	10135.54171	7.370071259	94.87299417	189,746	0.134408083	0.005403	0.000726207	43.54191178	5.907936334
LHDT2	Truck	Aggregated	Aggregated	DSL	4802.260083	166508.7652	60406.3906	10.23389815	10233.89815	16.27031682	113.6810551	227,362	1	0.005403	0.005403	323.953074	19.91068015
MCY	Passenger	Aggregated	Aggregated	GAS	30303.87519	203769.6783	60607.75038	5.439457816	5439.457816	37.46139509	47.34170457	94,683	0.041139631	0.005655	0.000232645	13.94890565	0.372354143
MDV	Truck	Aggregated	Aggregated	GAS	150190.4674	4749353.976	681491.928	228.4181027	228418.1027	20.79237119	2098.041272	4,196,083	0.958860369	0.113293	0.108632168	6513.367518	313.2575625
MDV	Truck	Aggregated	Aggregated	DSL	3183.545596	120771.4496	15325.08903	4.182416763	4182.416763	28.87599596	46.92857439	93,857	0.765961961	0.113293	0.086778128	5203.043024	180.1857512
MDV	Truck	Aggregated	Aggregated	ELEC	1127.725787	36901.45816	5725.011233	0	0	#DIV/0!	0	0	0.234038039	0.113293	0.026514872	1589.77867	#DIV/0!
MH	Other	Aggregated	Aggregated	GAS	2990.83134	25478.2097	299.2027673	5.282504092	5282.504092	4.823131087	50.03733464	100,075	0.732594425	0.000896	0.000656405	39.3567073	8.159991216
MH	Other	Aggregated	Aggregated	DSL	1076.008878	9299.845971	107.6008878	0.942714401	942.7144006	9.864966489	10.57767443	21,155	0.267405575	0.000896	0.000239595	14.3656607	1.456230056
MHDT	Truck	Aggregated	Aggregated	GAS	2071.192563	97303.04219	41440.4208	20.40968443	20409.68443	4.767493712	190.327734	380,655	0.126838762	0.022328	0.002832056	169.8044067	35.61712232
MHDT	Truck	Aggregated	Aggregated	DSL	13275.28807	669836.5959	102370.8497	69.51135266	69511.35266	9.636362555	757.4914876	1,514,983	0.873161238	0.022328	0.019495944	1168.937817	121.3048815
OBUS	Bus	Aggregated	Aggregated	GAS	560.2050231	24124.38457	11208.5821	5.0980697	5098.0697	4.732062524	47.72801094	95,456	0.392097521	0.001633	0.000640295	38.39082269	8.112915351
OBUS	Bus	Aggregated	Aggregated	DSL	532.1705243	37402.10639	5089.370305	4.675134648	4675.134648	8.000220145	51.00790085	102,016	0.607902479	0.001633	0.000992705	59.52059131	7.439869182
SBUS	Bus	Aggregated	Aggregated	GAS	126.484672	6096.481673	505.9386881	0.635020485	635.0204855	9.600448823	5.639736496	11,279	0.15792036	0.000779	0.00012302	7.376030804	0.768300622
SBUS	Bus	Aggregated	Aggregated	DSL	1040.458767	32508.30405	12006.74991	4.062341856	4062.341856	8.00235559	41.28284687	82,566	0.84207964	0.000779	0.00065598	39.3312512	4.914959196
UBUS	Bus	Aggregated	Aggregated	GAS	202.3269907	15275.52487	809.307963	3.561692379	3561.692379	4.288838913	33.66329907	67,327	0.3196798	0.001687	0.0005393	32.33533876	7.539415542
UBUS	Bus	Aggregated	Aggregated	DSL	2.109856914	135.6226039	8.439427656	0.015578662	15.57866188	8.705664512	0.174799508	350	0.008800292	0.001687	1.48461E-05	0.89014206	0.102248606
UBUS	Bus	Aggregated	Aggregated	ELEC	0.002191142	0.046907578	0.00876457	0	0	#DIV/0!	0	0	0.000345749	0.001687	5.83278E-07	0.034972201	#DIV/0!
																Gasoline Sum	2,033
																Diesel Sum	840

Notes: 59,958 Project VMT (mi/yr) from CalEEMod output

Operational Energy and GHG emissions from Emergency Generator and Pump

Equipment	Value	Unit	Comments
Generator			
Apparent power	300	KVA	
Power Factor	0.75		Conservative assumption based on a standard generator of similar size
Actual Power	225	KW	
Working hours	24	Hours/day	
Energy consumption	540.00	MWh/year	Assumption: the emergency generator would be needed to run for 100 days
Energy consumption	1842.48	MMbtu/yr	
CO ₂ emissions	35.7561	tons/year	
CH ₄ emissions	0.0027	tons/year	
N ₂ O emissions	0.00027	tons/year	
Total CO₂e	35.90406	tons/year	IPCC Fourth Assessment Report (Avg) (GWP - CH₄ = 25 and N₂O = 298)
Pump			
Energy consumption	3000	kWh/day	Assumption from information provided by the client (24-hour operation at 1,500 gpm and 78% pump efficiency)
Total energy consumption by the facility	1095	MWh/year	
CO ₂ emissions	72.505425	tons/year	
CH ₄ emissions	0.005475	tons/year	
N ₂ O emissions	0.0005475	tons/year	
Total CO ₂ e	72.805455	tons/year	
Total CO₂e	108.709515	tons/year	