Appendix F

Energy Assumptions and Calculations

ESA

Diamond Bar - Crooked Creek
Energy Assumptions and Calculations

1. Assumptions
2. Energy Use
3. EMFAC2017

1. Assumptions

Diamond Bar - Crooked Creek
Assumptions

CalEEMod Inputs (Non-Default information only)

Project Location	
County	Los Angeles
Air District	SCAQMD
Climate Zone	10
Construction Year start	2021
Operational Year Project	2023
Utility Provider	Southern California Edison
Source Receptor Area (SCAQMD)	10

	2021	2022	2023	2030	2040
CO intensity	483.27	462.58	441.90	300.8662	100.29
% renewable	35.75%	38.50%	41.25%	60.00%	86.67%

1 Southern California Edison, 2018. ESG/Sustainability Template. Report date: September 27, 2018. Available: https://www.edison.com/content/dam/eix/documents/sustainability/eix-esg-pilot-quantitative-section-sce.pdf. Accessed April 5, 2019.

2 SCE 2017 Power Content Label https://www.sce.com/sites/default/files/inline-files/2017PCL_0.pdf

3 SB-100 California Renewables Portfolio Standard Program: Emissions of Greenhouse Gases, https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180

Land Use	SQFT	Building KFS	Units/ Spaces	Acres	CalEEMod Category
Single Family Residential			7	1.90	light industrial
Parking/roadway				0.60	Other Asphalt
				2.50	

Population		Residents
# Bedrooms	32	
# Homes	7	14.00
# Non-Master Bedrooms	25	25.00
Total		39.00

Taken from the Project Description

Notes: Within the 7 residential units there are 5 accessory dwelling units (ADUs). These ADUs were added after the initial modeling. They do not increase the square footage of the homes, but will increase the number of trips.

Diamond Bar - Crooked Creek
Assumptions

Construction Schedule

Phase Name	CalEEMod Phase Name	Start Date	End Date	Days/week	Workdays
Site Preparation	Site Preparation	8/9/2021	8/13/2021	5.00	5
Grading/Retaining Wall Const	Grading	8/16/2021	10/5/2021	5.00	45
Underground Utilities Installation	Trenching	10/11/2021	12/3/2021	5.00	60
Street Improvements	Paving	12/6/2021	1/7/2022	5.00	30
Home Construction	Building Construction	1/10/2022	10/21/2022	5.00	180
Architectural Coating	Architectural Coating	9/10/2022	10/21/2022	5.00	30
					320

*Notes:
-For conservative emissions estimates all modeling was assumed to be conduccted in 2021. Modeling phase dates that differe from the provided dates are as follows:

CalEEMod Phase Name	Start Date	End Date
Stret Improvements	1/1/2021	2/11/2021
Building Construction	1/1/2021	9/9/2021
Architectura Coating	1/1/2021	2/11/2021

Materials Import/Export

	Cubic Yards
Grading:	5,760

Trips & VMT

Phase Name	Worker Trips	Worker Trips	Vendor Trucks	Haul Trucks
Site Preparation	8	16	0	50
Grading/Retaining Wall Const	10	20	0	570
Underground Utilities Installation	14	28	5	0
Street Improvements	15	30	0	0
Home Construction	14	28	5	0
Architectural Coating	(Part of Building Construction)			

Diamond Bar - Crooked Creek
Assumptions

Construction Equipmnet

PhaseName	Type	#	Hrs	HP
Site Preparation	Graders	1	8	187
Site Preparation	Scrapers	1	8	367
Site Preparation	Tractors/Loaders/Backhoes	1	7	97
Grading	Graders	3	8	187
Grading	Rubber Tired Dozers	1	8	247
Grading	Tractors/Loaders/Backhoes	2	7	97
Grading	Water Truck	1	8	402
Trenching	Excavator	1	7	158
Trenching	Tractor/Loader/Backhoe	2	8	97
Trenching	Water Truck	1	2	402
Paving	Cement and Mortar Mixers	1	8	9
Paving	Pavers	1	8	130
Paving	Paving Equipment	1	8	132
Paving	Rollers	2	8	80
Paving	Tractors/Loaders/Backhoes	1	8	97
Home Construction	Cranes	1	8	231
Home Construction	Forklifts	2	7	89
Home Construction	Generator Sets	1	8	84
Home Construction	Tractors/Loaders/Backhoes	1	6	97
Home Construction	Welders	3	8	46
Architectural Coating	Air Compressors	1	6	78

Diamond Bar - Crooked Creek
Operational Assumptions

Mobile source emissions

		Trip Gen	trips/day	Annual VMT
SFR	7	9.44	66	225,805
ADU	5	7.32	38	125,102
Revised SFR	7	14.67	104	350,907

Note: A revised SFR trip generation was generated based on the additional trips from the ADUs. This was done to allow for a revised loperational analysis for the 7 SFRs.

Source: Urban Crossroads. *Trip Generation & VMT Screening Assessment* .

Area Sources Default Modified to Fit SCAQMD's no wood fireplace/wood stove rule.

	Wood	Gas	None	Total
Default	0.35	5.95	0.70	7
% of Default		0.89	0.11	
Revised	0	6.26	0.74	7

Solid Waste Defaults Used

Water and Wastewater Defaults adjusted to account for sewer connection

	Default	Revised
Septic	10.30	0.00
Aerobic	87.46	97.51
Lagoon	2.21	2.46

Stationary Sources Assumed none

Energy Use Default Energy Usage used.

2. Energy Use

Diamond Bar - Crooked Creek
Energy Summary

Construction Fuel Consumption Summary

	gallons		
Phase	**Diesel**	**Gas**	**# Years**
Total	***42,318***	***4,731***	1.17
Annual Average	36,273	4,055	

County Usage[1]	246,000,000	3,189,000,000
Project % County	0.0147%	0.0001%

Construction	Total Gallons	
Onsite Equipment	34,434	diesel
Haul Trucks	5,777	diesel
Vendor Trucks	2,107	diesel
Worker Trips	4,731	gasoline

Annual OperationalConsumption

	gallons		MMBTU/yr	GWh/yr	
	Diesel	**Gas**	**Natural Gas**	**Electric**	
2025					
Unmitigated	1,985.00	11,065.00	198.70	0.06	61
% of County	*0.0008%*	*0.00035%*	0.00007%	0.000%	
%SCE/SoCal (2019)				0.0001%	

	kBTU	MMBTU	kWh	GWh	MWh
Total Project[2]	198,696.00	198.70	60,749	0.06	
County (2019)[3,4]		304,832,096		66,119	
SCE (2019)[5]				84,654	

Note: Total Project includes energy from increase in existing booster station.

Diamond Bar - Crooked Creek
Energy Summary

Operational Vehicle Fuel Consumption

source: EMFAC2017: Crooked Creek

	Project Unmitigated	
Gasoline	11,065	gallons
Diesel	1,985	gallons
Electric	0	GWh
Natural Gas	28	MMBTU

Assumptions/Constants

8.78	Kg of CO_2 per gallon of Gasoline		
10.21	Kg of CO_2 per gallon of Diesel		
1040	MMBtu/MMCF	1040	MMBtu
1	MWh=	0.001	GWh
100,000	BTU/therm		
1,036	btu/cubic foot		
3,048,320,959	Los Angeles (2019) Therms[3]		
1	hundred cubic feet of natural gas per gallon		

Construction	diesel	Used for trucks (haul and vendor) and off-road equipment
	gasoline	worker vehicles
Operation	diesel	Majority of trucks and buses
	gasoline	remaining vehicle mix

LCFS & Pavley assumed for on-road vehicles after year 2011

Sources:

1 California Energy Commission, 2018. California Retail Fuel Outlet Annual Reporting (CEC-A15) Results. https://www.energy.ca.gov/data-reports/energy-almanac/transportation-energy/california-retail-fuel-outlet-annual-reporting, Accessed, October 2020.

2 ESA, 2020 CalEEMod Output - Crooked Creek

3 http://www.ecdms.energy.ca.gov/gasbycounty.aspx

4 http://www.ecdms.energy.ca.gov/elecbycounty.aspx

5 Edison International and Southern California Edison, 2019. 2019 Annual Report. Available: https://www.edison.com/content/dam/eix/documents/investors/corporate-governance/eix-sce-2019-annual-report.pdf. Accessed October, 2020.

Diamond Bar - Crooked Creek
Unmitigated Fuel Conversion - Construction

	Total CO_2 MT/yr	Fuel Type	Factor $KGCO_2$/gal	Gallons
Onroad	*source:*	Crooked Creek		*11/6/2020*
Site Preparation	5.43	diesel	10.21	531
Grading/Retaining Wall Const	93.78	diesel	10.21	9,185
Underground Utilities Installation	37.29	diesel	10.21	3,652
Street Improvements	23.44	diesel	10.21	2,296
Home Construction	187.80	diesel	10.21	18,394
Architectural Coating	3.84	diesel	10.21	376

Onroad	*source:*	*Crooked Creek*		*11/6/2020*
	Hauling	**Vendor**	**Worker**	
Site Preparation	156	0	44	
Grading/Retaining Wall Const	5,621	0	495	
Underground Utilities Installation	0	527	924	
Street Improvements	0	0	495	
Home Construction	0	1,580	2,772	
Architectural Coating	0	0	0	

3. EMFAC2017

Crooked Creek

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

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Idling per Day (minutes)
Site Preparation	2021				
Total Haul Trips	50				
Hauling	10	5	10	20	15
Vendor	0	5	10	6.9	15
Worker	16	5	10	14.7	0
Grading	2021				
Total Haul Trips	570				
Hauling	40	45	10	20	15
Vendor	0	45	10	6.9	15
Worker	20	45	10	14.7	0
Trenching	2021				
Total Haul Trips	0				
Hauling	0	60	10	20	15
Vendor	10	60	10	6.9	15
Worker	28	60	10	14.7	0
Paving	2021				
Total Haul Trips	0				
Hauling	0	30	10	20	15
Vendor	0	30	10	6.9	15
Worker	30	30	10	14.7	0
Building Construction	2021				
Total Haul Trips	0				
Hauling	0	180	10	20	15
Vendor	10	180	10	6.9	15
Worker	28	180	10	14.7	0
Construction Phase	2021				
Total Haul Trips	0				
Hauling	0	1	10	20	15
Vendor	0	1	10	6.9	15
Worker	15	1	10	14.7	0

Crooked Creek

T **Total On-Road Fuel Consumption**

Construction Phase	Regional Emissions (gallons)						
	gal/mile	gal/min	gal/day	Total Gallons/yr			
Site Preparation							
Total Haul Trips							
Hauling	0.16	1.51E-05	31	156			
Vendor	0.13	9.12E-06	0	0			
Worker	0.04	2.06E-06	9	44			
Grading							
Total Haul Trips							
Hauling	0.16	1.51E-05	125	5,621			
Vendor	0.13	9.12E-06	0	0			
Worker	0.04	2.06E-06	11	495			
Trenching							
Total Haul Trips							
Hauling	0.16	1.51E-05	0	0			
Vendor	0.13	9.12E-06	9	527			
Worker	0.04	2.06E-06	15	924			
Paving							
Total Haul Trips							
Hauling	0.16	1.51E-05	0	0			
Vendor	0.13	9.12E-06	0	0			
Worker	0.04	2.06E-06	17	495			
Building Construction							
Total Haul Trips							
Hauling	0.16	1.51E-05	0	0			
Vendor	0.13	9.12E-06	9	1,580			
Worker	0.04	2.06E-06	15	2,772			
Construction Phase							
Total Haul Trips							
Hauling	0.16	1.51E-05	0	0			
Vendor	0.13	9.12E-06	0	0			
Worker	0.04	2.06E-06	8	8			

Crooked Creek
Operational Vehicle Fuel Consumption

	Existing	Op year 1	op year 2
Unmitigated CO_2e (MT/year)		120	
Mitigated CO_2e (MT/year)			

	Op year 1		
Summary	Unmitigated	Mitigated	
Gasolilne	11,065	0	gallons
Diesel	1,985	0.00	gallons
Electric	0.00	0.00	GWh
Natural Gas	28.49	0.00	MBTU

Operational Year 1 2023

Unmitigated Calculations

	% Emissions	CO_2e (MT)	CO_2e (kg)	CO_2e (lbs)	kg CO2/gallon	Gallons	Mcf	MBTU	GWh
Gasoline	0.81972918	98.36750166	98,368	NA	8.89	11,065	NA	NA	NA
Diesel	0.168098815	20.17185783	20,172	NA	10.16	1,985	NA	NA	NA
Electric	0	0	NA	0	NA	NA	NA	NA	0.00
Natural Gas	0.012172004	1.460640513	1,461	NA	NA	NA	27.50	28.49	NA

Emissions Percentage

	2023
Gasoline	0.81972918
Diesel	0.168098815
Electric	0
Natural Gas	0.012172004

Conversion Factors:

1000	kg/MT		
8.89	kg CO_2/gallon gasoline	https://www.eia.gov/environment/emissions/co2_vol_mass.php	Feb. 2016
10.16	kg CO_2/gallon diesel	https://www.eia.gov/environment/emissions/co2_vol_mass.php	Feb. 2016
53.12	kg CO_2/ thousand cubic feet	https://www.eia.gov/environment/emissions/co2_vol_mass.php	Feb. 2016
1036	btu/cubic foot		
610.932	CO_2 lbs/MWh	Project Specific Op Year 1 2021	
255.124	CO_2 lbs/MWh	Project Specific Op Year 2 2035	
0.907185	MT/ton		
2000	lbs/ton		