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SUBJECT: THE GRAND ENERGY TABLES

The following Energy Tables were prepared for the proposed The Grand development (referred to as "Project") which is located in the City of Redlands.

CONSTRUCTION POWER COSTS

Based on the *2022 National Construction Estimator* (1), the typical power cost per 1,000 square feet of building construction per month is estimated to be $2.41. The Project proposes to demolish the existing commercial building, surface parking and related infrastructure and to redevelop the site with a luxury apartment complex. The Project includes multi-family residential units and associated common open spaces. The Project would also develop a parking garage beneath the proposed building. The Project would include 146 multi-family dwelling units for a density of 98.7 dwelling units per acre (du/ac). The Project would also include approximately 22,948 square feet (sf) of common amenity space that includes a 12,214-sf roof deck and 10,733 sf pool plaza. Table 1 estimates the total power cost of the on-site electricity usage during the construction of the proposed Project to be approximately $11,928.78.

TABLE 1: PROJECT CONSTRUCTION POWER COST

Land Use	Power Cost (per 1,000 SF)	Size (1,000 SF)	Construction Duration (months)	Project Construction Power Cost
Apartments Mid Rise	$2.41	146.374	20	$7,055.23
Enclosed Parking with Elevator	$2.41	72.800	20	$3,508.96
Other Asphalt Surfaces	$2.41	28.311	20	$1,364.59
			CONSTRUCTION POWER COST	***$11,928.78***

CONSTRUCTION ELECTRICITY USAGE

The SCE's general service and residential rate schedule were used to determine the Project's electrical usage. As of January 1, 2022, SCE's general service rate is $0.13 per kilowatt hours (kWh) of electricity for commercial uses, $0.17 per kWh of electricity of residential uses, and $0.13 per kWh of electricity for street and area lighting (2), the total electricity usage from on-site Project construction related activities is estimated to be approximately 78,863 kWh.

TABLE 2: PROJECT CONSTRUCTION ELECTRICITY USAGE

Land Use	Cost per kWh	Project Construction Electricity Usage (kWh)
Apartments Mid Rise	$0.17	41,863
Enclosed Parking with Elevator	$0.13	26,640
Other Asphalt Surfaces	$0.13	10,360
CONSTRUCTION ELECTRICITY USAGE		***78,863***

CONSTRUCTION EQUIPMENT FUEL CONSUMPTION

Fuel consumption estimates are presented in Table 3. The aggregate fuel consumption rate for all equipment is estimated at 18.5 hp-hr-gal., obtained from California Air Resources Board (CARB) 2018 Emissions Factors Tables and cited fuel consumption rate factors presented in Table D-24 of the Moyer guidelines (3). For the purposes of this analysis, the calculations are based on all construction equipment being diesel-powered which is standard practice consistent with industry standards. Diesel fuel would be supplied by existing commercial fuel providers serving the City and region. As presented in Table 3, Project construction activities would consume an estimated 43,893 gallons of diesel fuel.

TABLE 3: CONSTRUCTION EQUIPMENT FUEL CONSUMPTION ESTIMATES

Construction Activity	Duration (Days)	Equipment	HP Rating	Quantity	Usage Hours	Load Factor	HP-hrs/day	Total Fuel Consumption
Demolition	20	Concrete/Industrial Saws	33	1	8	1	193	21
		Crawler Tractors	87	3	8	0	898	97
		Rubber Tired Dozers	367	1	8	0	1,174	127
Site Preparation	2	Crawler Tractors	87	1	8	0	299	32
		Graders	148	1	8	0	485	52
		Rubber Tired Dozers	367	1	8	0	1,174	127
Grading	4	Crawler Tractors	87	2	8	0	599	129
		Graders	148	1	8	0	485	105
		Rubber Tired Dozers	367	1	8	0	1,174	254
Building Construction	420	Cranes	367	1	8	0	851	19,330
		Crawler Tractors	87	1	8	0	299	6,794
		Forklifts	82	1	8	0	131	2,979
		Generator Sets	14	1	8	1	83	1,882
		Welders	46	3	8	0	497	11,279
Paving	10	Cement and Mortar Mixers	10	1	8	1	45	24
		Crawler Tractors	87	1	8	0	299	162
		Pavers	81	1	8	0	272	147
		Paving Equipment	89	1	8	0	256	139
		Rollers	36	1	8	0	109	59
Architectural Coating	20	Air Compressors	37	1	8	0	142	154
							CONSTRUCTION FUEL DEMAND (GALLONS DIESEL FUEL)	***43,893***

CONSTRUCTION WORKER FUEL ESTIMATES

For purposes of analysis, it is assumed that 50% of all worker trips are from light-duty-auto vehicles (LDA), 25% are from light-duty-trucks with a gross vehicle weight rating (GVWR) of less than 6,000 lbs. and equivalent test weight (ETW) of less than or equal to 3,750 lbs (LDT1), and 25% are from light-duty-trucks with a GVWR of less than 6,000 lbs. and ETW between 3,751 lbs. and 5,750 lbs (LDT2). Data regarding Project related construction worker trips were based on CalEEMod 2022.1 model defaults utilized within the AQIA. Vehicle fuel efficiencies for LDAs, LDT1s, and LDT2s were estimated using information generated within the 2021 version of the EMFAC developed by the CARB.

Table 4 provides an estimated annual fuel consumption resulting from the Project generated by LDAs, LDT1s, and LDT2s related to construction worker trips. Based on Table 4, it is estimated that 39,147 gallons of fuel will be consumed related to construction worker trips during full construction of the proposed Project.

TABLE 4: CONSTRUCTION WORKER FUEL CONSUMPTION ESTIMATES (1 OF 2)

Year	Construction Activity	Duration (Days)	Worker Trips/Day	Trip Length (miles)	VMT	Average Vehicle Fuel Economy (mpg)	Estimated Fuel Consumption (gallons)
2023	LDA						
	Demolition	20	7	14.7	2,058	30.68	67
	Site Preparation	2	4	18.5	148	30.68	5
	Grading	4	5	18.5	370	30.68	12
	Building Construction	126	68	18.5	158,508	30.68	5,166
	LDT1						
	Demolition	20	4	14.7	1,176	24.14	49
	Site Preparation	2	2	18.5	74	24.14	3
	Grading	4	3	18.5	222	24.14	9
	Building Construction	126	34	18.5	79,254	24.14	3,283
	LDT2						
	Demolition	20	4	14.7	1,176	23.82	49
	Site Preparation	2	2	18.5	74	23.82	3
	Grading	4	3	18.5	222	23.82	9
	Building Construction	126	34	18.5	79,254	23.82	3,327

TABLE 4: CONSTRUCTION WORKER FUEL CONSUMPTION ESTIMATES (2 OF 2)

Year	Construction Activity	Duration (Days)	Worker Trips/Day	Trip Length (miles)	VMT	Average Vehicle Fuel Economy (mpg)	Estimated Fuel Consumption (gallons)
2024	LDA						
	Building Construction	262	68	18.5	329,596	31.57	10,439
	LDT1						
	Building Construction	262	34	18.5	164,798	24.59	6,701
	LDT2						
	Building Construction	262	34	18.5	164,798	24.51	6,725
	LDA						
	Building Construction	32	68	18.5	40,256	32.57	1,236
	Paving	10	7	18.5	1,295	32.57	40
	Architectural Coating	20	14	18.5	5,180	32.57	159
	LDT1						
	Building Construction	32	34	18.5	20,128	25.11	801
	Paving	10	4	18.5	740	25.11	29
	Architectural Coating	20	7	18.5	2,590	25.11	103
	LDT2						
	Building Construction	32	34	18.5	20,128	25.24	798
	Paving	10	4	18.5	740	25.24	29
	Architectural Coating	20	7	18.5	2,590	25.24	103
TOTAL CONSTRUCTION WORKER FUEL CONSUMPTION							***39,147***

CONSTRUCTION VENDOR FUEL ESTIMATES

It is assumed that 50% of all vendor trips are from Medium-Heavy-Duty-Trucks (MHDT) and 50% are from Heavy-Heavy-Duty Trucks (HHDT). These assumptions are consistent with the CalEEMod 2022.1 defaults utilized within the within the AQIA. Vehicle fuel efficiencies for MHDTs and HHDTs were estimated using information generated within EMFAC2021.

Table 5 shows the estimated fuel economy of MHDTs and HHDTs accessing the Project site. Based on Table 5, fuel consumption from construction trips will total approximately 17,248 gallons.

TABLE 5: CONSTRUCTION VENDOR/HAULING FUEL CONSUMPTION ESTIMATES

Year	Construction Activity	Duration (Days)	Vendor/ Hauling Trips/Day	Trip Length (miles)	VMT	Average Vehicle Fuel Economy (mpg)	Estimated Fuel Consumption (gallons)
2023	MHDT						
	Demolition	20	1	6.9	138	8.30	17
	Site Preparation	2	1	10.2	20	8.30	2
	Grading	4	1	10.2	41	8.30	5
	Building Construction	126	13	10.2	16,708	8.30	2,014
	HHDT (Vendor)						
	Demolition	20	1	6.9	138	5.94	23
	Site Preparation	2	1	10.2	20	5.94	3
	Grading	4	1	10.2	41	5.94	7
	Building Construction	126	13	10.2	16,708	5.94	2,812
	HHDT (Hauling)						
	Demolition	20	4	20	1,600	5.94	269
	Grading	4	72	20	5,760	5.94	970
2024	MHDT						
	Building Construction	262	13	10.2	34,741	8.34	4,165
	HHDT (Vendor)						
	Building Construction	262	13	10.2	34,741	6.03	5,766
2025	MHDT						
	Building Construction	32	13	10.2	4,243	8.43	503
	HHDT (Vendor)						
	Building Construction	32	13	10.2	4,243	6.13	692
TOTAL CONSTRUCTION VENDOR/HAULING FUEL CONSUMPTION							***17,248***

TRANSPORTATION ENERGY DEMANDS

Energy that would be consumed by Project-generated traffic is a function of total VMT and estimated vehicle fuel economies of vehicles accessing the Project site. Table 6 presents the estimated annual fuel consumption from project-generated traffic.

TABLE 6: PROJECT-GENERATED TRAFFIC ANNUAL FUEL CONSUMPTION

Vehicle Type	Average Vehicle Fuel Economy (mpg)	Annual VMT	Estimated Annual Fuel Consumption (gallons)
LDA	32.57	1,843,785	56,615
LDT1	25.11	149,130	5,938
LDT2	25.24	751,521	29,777
MDV	20.54	566,367	27,572
LHDT1	16.22	106,228	6,551
LHDT2	15.27	28,874	1,891
MHDT	8.43	63,768	7,562
HHDT	6.13	64,704	10,555
OBUS	6.20	2,275	367
UBUS	4.86	1,157	238
MCY	42.15	77,592	1,841
SBUS	6.44	4,025	625
MH	5.77	16,977	2,941
TOTAL ANNUAL FUEL CONSUMPTION		***3,676,403***	***152,474***

MDV = Medium Duty Trucks; LHDT1 = Light-Duty Trucks (Vehicles under the LHDT1 category have a GVWR of 8,501 to 10,000 lbs.);
LHDT2 = Light-Duty Trucks (Vehicles under the LHDT2 category have a GVWR of 10,001 to 14,000 lbs.); OBUS = Other Buses; UBUS = Urban Buses
MCY = Motorcycle; SBUS = School Bus; MH = Motorhome

FACILITY ENERGY DEMANDS

Project building operations and Project site maintenance activities would result in the consumption of natural gas and electricity. Natural gas would be supplied to the Project by Southern California Gas (SoCalGas) and electricity would be supplied to the Project by SCE. Annual natural gas and electricity demands of the Project are summarized in Table 7.

TABLE 7: PROJECT ANNUAL OPERATIONAL NATURAL GAS AND ELECTRICITY DEMAND SUMMARY

Land Use	Natural Gas Demand (kBTU/year)	Electricity Demand (kWh/year)
Apartments Mid Rise	1,611,428	630,160
Enclosed Parking with Elevator	0	0
Other Asphalt Surfaces	0	0
TOTAL PROJECT ENERGY DEMAND	***1,611,428***	***630,160***

REFERENCES

1. **Pray, Richard.** *2022 National Construction Estimator.* Carlsbad : Craftsman Book Company, 2022.
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