Greenhouse Gas Emission Calculations

Greenhouse Gas Emissions Calculations

for Existing Conditions

Existing Conditions - OVOV Planning Area
Indirect GHG Emissions from Electrical Demand

Land Use	Units	Electrical Demand Factor[1] (kW-hr/unit/yr)	Annual Demand Factor (10^6 kW-hr/yr)	CO_2E Emission Factor[2] (MT $CO_2E/10^6$ kW-hr)	Annual CO_2E Emissions (MT CO_2E/yr)
Residential	72,638 Unit	5,656.50	410.88	399	**164,005.60**
FoodStore	1,341,840 Sq.Ft.	53.30	71.52	399	**28,547.95**
Restaurant	212,030 Sq.Ft.	47.45	10.06	399	**4,015.88**
Hospital	149,900 Sq.Ft.	21.70	3.25	399	**1,298.40**
Retail	2,576,562 Sq.Ft.	13.55	34.91	399	**13,935.64**
Movie Theater (3)	82,500 Sq.Ft.	13.55	1.12	399	**446.21**
College/University	459,475 Sq.Ft.	11.55	5.31	399	**2,118.32**
High School	262,500 Sq.Ft.	10.50	2.76	399	**1,100.18**
Elementary School	747,550 Sq.Ft.	5.90	4.41	399	**1,760.51**
Daycare	11,500 Sq.Ft.	5.90	0.07	399	**27.08**
Office	2,704,040 Sq.Ft.	12.95	35.02	399	**13,977.51**
Hotel/Motel	390,000 Sq.Ft.	9.95	3.88	399	**1,548.94**
Warehouse	0 Sq.Ft.	4.35	-	399	**-**
Miscellaneous	19,195,560 Sq.Ft.	10.50	201.55	399	**80,452.05**
				Projected GHG Emissions from Electrical Demand	**313,234.28**

Sources:
1. South Coast Air Quality Management District, *CEQA Air Quality Handbook*, (1993) Table A9-11-A.

2. California Climate Action Registry, "Reporting Online Tool, Public Annual Entity Emissions," *Southern California Edison, PUP Report*, (2006), http://www.climateregistry.org/CARROT/public/Reports.aspx.

Where:

CO_2E	Carbon dioxide equivalent
GWP	Global warming potential
kW-hr	Kilowatt-hour
lbs	Pounds
MT	Metric ton
yr	Year

Impact Sciences, Inc.
Prepared by R. Mamaghani
12 March 2009

JN 112-23

Existing Conditions - OVOV Planning Area
GHG Emissions from Solid Waste Generation

Land Use	Size	Unit	Rate (Tons/yr)	Solid Waste Generation (Tons/yr)	CO_2E Emission Factor[2] (MT CO_2E/MT waste)	Annual CO_2E Emissions (MT CO_2E/yr)
Single Family Detached	46,071	du	1.0200	46,992.42	0.11	**4,689.39**
Multi-Family or Attached	24,387	du	0.5850	14,266.40	0.11	**1,423.65**
Mobile Home	2,180	du	0.5850	1,275.30	0.11	**127.26**
General Retail	7,811,260	sq. ft.	0.0012	9,373.51	0.11	**935.39**
Eating/Drnkng Establ.	212,030	sq. ft.	0.0054	1,144.96	0.11	**114.26**
Food & Drug Stores	1,341,840	sq. ft.	0.0036	4,830.62	0.11	**482.05**
Auto Dlr/Service Sta.	399,500	sq. ft.	0.0026	1,018.73	0.11	**101.66**
Hotel & Motel	390,000	sq. ft.	0.0027	1,033.50	0.11	**103.13**
Warehouse	0	sq. ft.	0.0006	0.00	0.11	**-**
Medical Offices	133,730	sq. ft.	0.0014	180.54	0.11	**18.02**
Hospitals	149,900	sq. ft.	0.0028	412.23	0.11	**41.14**
Business Park	16,441,130	sq. ft.	0.0007	11,508.79	0.11	**1,148.47**
Office	2,162,420	sq. ft.	0.0007	1,513.69	0.11	**151.05**
Library 3	53,730	sq. ft.	0.0007	37.61	0.11	**3.75**
Education & Schools	1,021,550	sq. ft.	0.0007	664.01	0.11	**66.26**
College	459,475	sq. ft.	0.0007	298.66	0.11	**29.80**
Trans., Comm., Utilities	903,440	sq. ft.	0.0040	3,568.59	0.11	**356.11**
Special Generator 4	0	sq. ft.	0.0040	0.00	0.11	**-**
Golf Course/Park	872	acres	0.1000	87.19	0.11	**8.70**
Manufacturing	1,850,990	sq. ft.	0.0025	4,627.48	0.11	**461.78**
Church 3	487,890	sq. ft.	0.0007	341.52	0.11	**34.08**
				Projected GHG Emissions From Solid Waste Disposal		**10,295.94**

du = dwelling unit; sq.ft. - square feet; tpy = tons per year; lbs. = pounds

Sources:

1. Ventura County Solid Waste Management Department's Guidelines for Preparation of Environmental Assessments for Solid Waste Impacts. Assumes 50% diversion.

2. US Environmental Protection Agency, Office of Solid Waste and Emergency Response, *Greenhouse Gas Emission Factors for Management of Selected Materials in Municipal Solid Waste (EPA-530-R-98-013)*, (1998). The factor is based on mixed municipal solid waste as disposed in landfills without landfill gas recovery.

Where:

CO_2E	Carbon dioxide equivalent
MT	Metric ton
yr	Year

3. Assumes same generation rate as for office.

4. Conservatively assumes same generation rate as utilities.

Existing Conditions - OVOV Planning Area
GHG Emission from Potable Water Treatment and Conveyance

Land Use	Action	Net Potable Water Needs Estimate[1] (MG/yr)	Electrical Demand Factor[2,3] (kW-hr/MG)	Annual Electrical Demand (10^6 kW-hr/year)	CO_2E Emission Factor[4] (MT $CO_2E/10^6$ kW-hr)	Annual CO_2E Emissions (MT CO_2E/yr)
Net Project	Supply & Conveyance	32,780.61	9,727	318.857	290	92,468.53
Net Project	Treatment	32,780.61	111	3.639	290	1,055.21
Net Project	Distribution	32,780.61	1,272	41.697	290	12,092.11
					Projected GHG Emissions From Water Demand	**105,615.85**

Sources:

1. Section 3.13, Water Services
2. California Energy Commission, *California's Water-Energy Relationship, Final Staff Report (CEC-700-2005-011-SF)*, (2005) 26.
3. California Energy Commission, *Refining Estimates of Water-Related Energy Use in California, PIER Final Project Report (CEC-500-2006-118)*, (2006) 22. Prepared by Navigant Consulting, Inc.
4. California Climate Action Registry, "Reporting Online Tool, Public Annual Entity Emissions," *Southern California Edison, PUP Report*, (2006), http://www.climateregistry.org/CARROT/public/Reports.aspx.

Where:

CO_2E	Carbon dioxide equivalent
GWP	Global warming potential
kW-hr	Kilowatt-hour
lbs	Pounds
MG	Million gallons
MT	Metric ton
N_2O	Nitrous oxide
yr	Year

Existing Conditions, OVOV Planning Area
GHG Emission from Wastewater Collection and Treatment

Wasterwater Treatment Electrical Demand GHG Emissions

Land Use	Net Wastewater Generation Rate[1] (MG/yr)	Electrical Demand Factor[2] (kW-hr/MG)	Annual Demand Factor (10^b kW-hr/yr)	CO_2E Emision Factor[3] (MT $CO_2E/10^6$ kW-hr)	Annual CO_2E Emissions (MT CO_2E/yr)
Net Project	19,668.37	1,911	37.59	399	**15,002.93**

Sources:
1. Section 3.13, Water Service. Assumes that 60% of water demand would be wastewater.
2. California Energy Commission, *Refining Estimates of Water-Related Energy Use in California, PIER Final Project Report (CEC-500-2006-118)*. Prepared
3. California Climate Action Registry, "Reporting Online Tool, Public Annual Entity Emissions," *Southern California Edison, PUP Report*, (2006),

Wastewater Treatment Process GHG Emissions[1]

Project	Maximum Population	Pounds BOD5 per Capita per Day[2] (lbs BOD5/capita/day)	Pounds CH_4 per Pound BOD5[3] (lbs CH_4/BOD5)	Fraction Anaerobically Digested[4]	Annual CO_2E Emissions (MT CO_2E/yr)
Net Project	252,000	0.13	0.22	0.15	**3,758.68**

Sources:
1. US Environmental Protection Agency, *Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, Volume I, Chapter 4.3.5*, (1998). Data is not available to determine CO_2
2. The US EPA recommends a default value of 0.13 lb BOD5/capita/day.
3. The US EPA recommends a default value of 0.22 lb CH_4/BOD5.
4. The US EPA recommends a default value of 15% for the fraction anaerobically digested for domestic wastewater.

Where:

BOD5	Biological oxygen demand using a standard 5 day test	18,761.61
CH_4	Methane	
CO_2	Carbon dioxide	
CO_2E	Carbon dioxide equivalent	
GWP	Global warming potential	
kW-hr	Kilowatt-hour	
lbs	Pounds	
MG	Million gallons	
MT	Metric ton	
N_2O	Nitrous oxide	
yr	Year	

Greenhouse Gas Emissions Calculations

for Existing General Plan and Area Plan

Existing General Plan
Indirect GHG Emissions from Electrical Demand

Land Use	Units	Electrical Demand Factor[1] (kW-hr/unit/yr)	Annual Demand Factor (10^6 kW-hr/yr)	CO_2E Emission Factor[2] (MT $CO_2E/10^6$ kW-hr)	Annual CO_2E Emissions (MT CO_2E/yr)
Residential	151,916 Unit	5,656.50	859.31	399	**343,003.32**
FoodStore	3,182,757 Sq.Ft.	53.30	169.64	399	**67,713.88**
Restaurant	343,270 Sq.Ft.	47.45	16.29	399	**6,501.58**
Hospital	345,840 Sq.Ft.	21.70	7.50	399	**2,995.59**
Retail	3,923,329 Sq.Ft.	13.55	53.16	399	**21,219.79**
Movie Theater (3)	82,500 Sq.Ft.	13.55	1.12	399	**446.21**
College/University	833,400 Sq.Ft.	11.55	9.63	399	**3,842.22**
High School	586,100 Sq.Ft.	10.50	6.15	399	**2,456.45**
Elementary School	1,218,575 Sq.Ft.	5.90	7.19	399	**2,869.80**
Daycare	13,500 Sq.Ft.	5.90	0.08	399	**31.79**
Office	8,917,970 Sq.Ft.	12.95	115.49	399	**46,098.07**
Hotel/Motel	678,400 Sq.Ft.	9.95	6.75	399	**2,694.36**
Warehouse	0 Sq.Ft.	4.35	-	399	**-**
Miscellaneous	50,950,550 Sq.Ft.	10.50	534.98	399	**213,542.93**
				Projected GHG Emissions from Electrical Demand	**713,415.99**

Sources:
1. South Coast Air Quality Management District, *CEQA Air Quality Handbook*, (1993) Table A9-11-A.

2. California Climate Action Registry, "Reporting Online Tool, Public Annual Entity Emissions," *Southern California Edison, PUP Report*, (2006), http://www.climateregistry.org/CARROT/public/Reports.aspx.

Where:

CO_2E	Carbon dioxide equivalent
GWP	Global warming potential
kW-hr	Kilowatt-hour
lbs	Pounds
MT	Metric ton
yr	Year

Impact Sciences, Inc.
Prepared by R. Mamaghani
12 March 2009

JN 112-23

Existing General Plan
GHG Emissions from Solid Waste Generation

Land Use	Size	Unit	Rate (Tons/yr)	Solid Waste Generation (Tons/yr)	CO_2E Emission Factor[2] (MT CO_2E/MT waste)	Annual CO_2E Emissions (MT CO_2E/yr)
Single Family Detached	86,808	du	1.0200	88,544.16	0.11	**8,835.85**
Multi-Family or Attached	62,543	du	0.5850	36,587.66	0.11	**3,651.09**
Mobile Home	2,565	du	0.5850	1,500.53	0.11	**149.74**
General Retail	18,243,123	sq. ft.	0.0012	21,891.75	0.11	**2,184.59**
Eating/Drnkng Establ.	343,270	sq. ft.	0.0054	1,853.66	0.11	**184.98**
Food & Drug Stores	3,182,757	sq. ft.	0.0036	11,457.93	0.11	**1,143.39**
Auto Dlr/Service Sta.	441,500	sq. ft.	0.0026	1,125.83	0.11	**112.35**
Hotel & Motel	678,400	sq. ft.	0.0027	1,797.76	0.11	**179.40**
Warehouse	0	sq. ft.	0.0006	0.00	0.11	**-**
Medical Offices	412,290	sq. ft.	0.0014	556.59	0.11	**55.54**
Hospitals	345,840	sq. ft.	0.0028	951.06	0.11	**94.91**
Business Park	45,656,650	sq. ft.	0.0007	31,959.66	0.11	**3,189.27**
Office	8,240,680	sq. ft.	0.0007	5,768.48	0.11	**575.64**
Library 3	71,400	sq. ft.	0.0007	49.98	0.11	**4.99**
Education & Schools	1,818,175	sq. ft.	0.0007	1,181.81	0.11	**117.93**
College	833,400	sq. ft.	0.0007	541.71	0.11	**54.06**
Trans., Comm., Utilities	1,250,240	sq. ft.	0.0040	4,938.45	0.11	**492.81**
Special Generator 4	0	sq. ft.	0.0040	0.00	0.11	**-**
Golf Course/Park	1,791	acres	0.1000	179.07	0.11	**17.87**
Manufacturing	4,043,660	sq. ft.	0.0025	10,109.15	0.11	**1,008.80**
Church 3	605,890	sq. ft.	0.0007	424.12	0.11	**42.32**
				Projected GHG Emissions From Solid Waste Disposal		**22,095.51**

du = dwelling unit; sq.ft. - square feet; tpy = tons per year; lbs. = pounds

Sources:

1. Ventura County Solid Waste Management Department's Guidelines for Preparation of Environmental Assessments for Solid Waste Impacts. Assumes 50% diversion.

2. US Environmental Protection Agency, Office of Solid Waste and Emergency Response, *Greenhouse Gas Emission Factors for Management of Selected Materials in Municipal Solid Waste (EPA-530-R-98-013)*, (1998). The factor is based on mixed municipal solid waste as disposed in landfills without landfill gas recovery.

Where:

CO_2E	Carbon dioxide equivalent
MT	Metric ton
yr	Year

3. Assumes same generation rate as for office.

4. Conservatively assumes same generation rate as utilities.

OVOV
GHG Emissions from Solid Waste Generation

Land Use	Size	Unit	Rate (Tons/yr)	Solid Waste Generation (Tons/yr)	CO_2E Emission Factor[2] (MT CO_2E/MT waste)	Annual CO_2E Emissions (MT CO_2E/yr)
Single Family Detached	77,975	du	1.0200	79,534.50	0.11	**7,936.78**
Multi-Family or Attached	67,679	du	0.5850	39,592.22	0.11	**3,950.92**
Mobile Home	3,420	du	0.5850	2,000.70	0.11	**199.65**
General Retail	19,974,282	sq. ft.	0.0012	23,969.14	0.11	**2,391.89**
Eating/Drnkng Establ.	354,140	sq. ft.	0.0054	1,912.36	0.11	**190.83**
Food & Drug Stores	3,484,638	sq. ft.	0.0036	12,544.70	0.11	**1,251.84**
Auto Dlr/Service Sta.	530,000	sq. ft.	0.0026	1,351.50	0.11	**134.87**
Hotel & Motel	1,010,800	sq. ft.	0.0027	2,678.62	0.11	**267.30**
Warehouse	0	sq. ft.	0.0006	0.00	0.11	**-**
Medical Offices	730,560	sq. ft.	0.0014	986.26	0.11	**98.42**
Hospitals	365,160	sq. ft.	0.0028	1,004.19	0.11	**100.21**
Business Park	44,484,350	sq. ft.	0.0007	31,139.05	0.11	**3,107.38**
Office	10,344,450	sq. ft.	0.0007	7,241.12	0.11	**722.59**
Library 3	91,400	sq. ft.	0.0007	63.98	0.11	**6.38**
Education & Schools	1,767,675	sq. ft.	0.0007	1,148.99	0.11	**114.66**
College	901,550	sq. ft.	0.0007	586.01	0.11	**58.48**
Trans., Comm., Utilities	1,032,440	sq. ft.	0.0040	4,078.14	0.11	**406.96**
Special Generator 4	0	sq. ft.	0.0040	0.00	0.11	**-**
Golf Course/Park	2,378	acres	0.1000	237.82	0.11	**23.73**
Manufacturing	3,268,690	sq. ft.	0.0025	8,171.73	0.11	**815.46**
Church 3	997,460	sq. ft.	0.0007	698.22	0.11	**69.68**
				Projected GHG Emissions From Solid Waste Disposal		**21,848.02**

du = dwelling unit; sq.ft. - square feet; tpy = tons per year; lbs. = pounds

Sources:

1. Ventura County Solid Waste Management Department's Guidelines for Preparation of Environmental Assessments for Solid Waste Impacts. Assumes 50% diversion.

2. US Environmental Protection Agency, Office of Solid Waste and Emergency Response, *Greenhouse Gas Emission Factors for Management of Selected Materials in Municipal Solid Waste (EPA-530-R-98-013)*, (1998). The factor is based on mixed municipal solid waste as disposed in landfills without landfill gas recovery.

Where:

CO_2E	Carbon dioxide equivalent
MT	Metric ton
yr	Year

3. Assumes same generation rate as for office.

4. Conservatively assumes same generation rate as utilities.

Existing General Plan
GHG Emission from Potable Water Treatment and Conveyance

Land Use	Action	Net Potable Water Needs Estimate[1] (MG/yr)	Electrical Demand Factor[2,3] (kW-hr/MG)	Annual Electrical Demand (10^6 kW-hr/year)	CO_2E Emission Factor[4] (MT $CO_2E/10^6$ kW-hr)	Annual CO_2E Emissions (MT CO_2E/yr)
Net Project	Supply & Conveyance	44,934.85	9,727	437.081	290	126,753.58
Net Project	Treatment	44,934.85	111	4.988	290	1,446.45
Net Project	Distribution	44,934.85	1,272	57.157	290	16,575.57
					Projected GHG Emissions From Water Demand	**144,775.60**

Sources:

1. Section 3.13, Water Services
2. California Energy Commission, *California's Water-Energy Relationship, Final Staff Report (CEC-700-2005-011-SF)*, (2005) 26.
3. California Energy Commission, *Refining Estimates of Water-Related Energy Use in California, PIER Final Project Report (CEC-500-2006-118)*, (2006) 22. Prepared by Navigant Consulting, Inc.
4. California Climate Action Registry, "Reporting Online Tool, Public Annual Entity Emissions," *Southern California Edison, PUP Report*, (2006), http://www.climateregistry.org/CARROT/public/Reports.aspx.

Where:

CO_2E	Carbon dioxide equivalent
GWP	Global warming potential
kW-hr	Kilowatt-hour
lbs	Pounds
MG	Million gallons
MT	Metric ton
N_2O	Nitrous oxide
yr	Year

Existing General Plan
GHG Emission from Wastewater Collection and Treatment

Wasterwater Treatment Electrical Demand GHG Emissions

Land Use	Net Wastewater Generation Rate[1] (MG/yr)	Electrical Demand Factor[2] (kW-hr/MG)	Annual Demand Factor (10^6 kW-hr/yr)	CO_2E Emision Factor[3] (MT $CO_2E/10^6$ kW-hr)	Annual CO_2E Emissions (MT CO_2E/yr)
Net Project	26,960.91	1,911	51.52	399	**20,565.64**

Sources:
1. Section 3.13, Water Service. Assumes that 60% of water demand would be wastewater.
2. California Energy Commission, *Refining Estimates of Water-Related Energy Use in California, PIER Final Project Report (CEC-500-2006-118)*. Prepared
3. California Climate Action Registry, "Reporting Online Tool, Public Annual Entity Emissions," *Southern California Edison, PUP Report*, (2006),

Wastewater Treatment Process GHG Emissions[1]

Project	Maximum Population	Pounds BOD5 per Capita per Day[2] (lbs BOD5/capita/day)	Pounds CH_4 per Pound BOD5[3] (lbs CH_4/BOD5)	Fraction Anaerobically Digested[4]	Annual CO_2E Emissions (MT CO_2E/yr)
Net Project	448,310	0.13	0.22	0.15	**6,686.73**

Sources:
1. US Environmental Protection Agency, *Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, Volume I, Chapter 4.3.5*, (1998). Data is not available to determine CO_2
2. The US EPA recommends a default value of 0.13 lb BOD5/capita/day.
3. The US EPA recommends a default value of 0.22 lb CH_4/BOD5.
4. The US EPA recommends a default value of 15% for the fraction anaerobically digested for domestic wastewater.

Where:

BOD5	Biological oxygen demand using a standard 5 day test
CH_4	Methane
CO_2	Carbon dioxide
CO_2E	Carbon dioxide equivalent
GWP	Global warming potential
kW-hr	Kilowatt-hour
lbs	Pounds
MG	Million gallons
MT	Metric ton
N_2O	Nitrous oxide
yr	Year

27,252.37

Greenhouse Gas Emissions Calculations

for Proposed General Plan and Area Plan

OVOV
Indirect GHG Emissions from Electrical Demand

Land Use	Units	Electrical Demand Factor[1] (kW-hr/unit/yr)	Annual Demand Factor (10^6 kW-hr/yr)	CO_2E Emission Factor[2] (MT $CO_2E/10^6$ kW-hr)	Annual CO_2E Emissions (MT CO_2E/yr)
Residential	149,074 Unit	5,656.50	843.24	399	**336,586.51**
FoodStore	3,484,638 Sq.Ft.	53.30	185.73	399	**74,136.47**
Restaurant	354,140 Sq.Ft.	47.45	16.80	399	**6,707.46**
Hospital	365,160 Sq.Ft.	21.70	7.92	399	**3,162.93**
Retail	4,905,463 Sq.Ft.	13.55	66.47	399	**26,531.77**
Movie Theater (3)	90,000 Sq.Ft.	13.55	1.22	399	**486.78**
College/University	901,550 Sq.Ft.	11.55	10.41	399	**4,156.41**
High School	462,500 Sq.Ft.	10.50	4.86	399	**1,938.42**
Elementary School	1,291,675 Sq.Ft.	5.90	7.62	399	**3,041.95**
Daycare	13,500 Sq.Ft.	5.90	0.08	399	**31.79**
Office	11,133,310 Sq.Ft.	12.95	144.18	399	**57,549.44**
Hotel/Motel	1,010,800 Sq.Ft.	9.95	10.06	399	**4,014.54**
Warehouse	0 Sq.Ft.	4.35	-	399	**-**
Miscellaneous	48,785,480 Sq.Ft.	10.50	512.25	399	**204,468.73**
				Projected GHG Emissions from Electrical Demand	**722,813.21**

Sources:
1. South Coast Air Quality Management District, *CEQA Air Quality Handbook*, (1993) Table A9-11-A.

2. California Climate Action Registry, "Reporting Online Tool, Public Annual Entity Emissions," *Southern California Edison, PUP Report*, (2006), http://www.climateregistry.org/CARROT/public/Reports.aspx.

Where:

CO_2E	Carbon dioxide equivalent
GWP	Global warming potential
kW-hr	Kilowatt-hour
lbs	Pounds
MT	Metric ton
yr	Year

Impact Sciences, Inc.
Prepared by R. Mamaghani
12 March 2009

JN 112-23

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GHG Emission from Potable Water Treatment and Conveyance

Land Use	Action	Net Potable Water Needs Estimate[1] (MG/yr)	Electrical Demand Factor[2,3] (kW-hr/MG)	Annual Electrical Demand (10^6 kW-hr/year)	CO_2E Emission Factor[4] (MT $CO_2E/10^6$ kW-hr)	Annual CO_2E Emissions (MT CO_2E/yr)
Net Project	Supply & Conveyance	44,934.85	9,727	437.081	290	126,753.58
Net Project	Treatment	44,934.85	111	4.988	290	1,446.45
Net Project	Distribution	44,934.85	1,272	57.157	290	16,575.57
					Projected GHG Emissions From Water Demand	**144,775.60**

Sources:

1. Section 3.13, Water Services
2. California Energy Commission, *California's Water-Energy Relationship, Final Staff Report (CEC-700-2005-011-SF)*, (2005) 26.
3. California Energy Commission, *Refining Estimates of Water-Related Energy Use in California, PIER Final Project Report (CEC-500-2006-118)*, (2006) 22. Prepared by Navigant Consulting, Inc.
4. California Climate Action Registry, "Reporting Online Tool, Public Annual Entity Emissions," *Southern California Edison, PUP Report*, (2006), http://www.climateregistry.org/CARROT/public/Reports.aspx.

Where:

CO_2E	Carbon dioxide equivalent
GWP	Global warming potential
kW-hr	Kilowatt-hour
lbs	Pounds
MG	Million gallons
MT	Metric ton
N_2O	Nitrous oxide
yr	Year

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GHG Emission from Wastewater Collection and Treatment

Wasterwater Treatment Electrical Demand GHG Emissions

Land Use	Net Wastewater Generation Rate[1] (MG/yr)	Electrical Demand Factor[2] (kW-hr/MG)	Annual Demand Factor (10^b kW-hr/yr)	CO_2E Emision Factor[3] (MT $CO_2E/10^6$ kW-hr)	Annual CO_2E Emissions (MT CO_2E/yr)
Net Project	26,960.91	1,911	51.52	399	**20,565.64**

Sources:

1. Section 3.13, Water Service. Assumes that 60% of water demand would be wastewater.
2. California Energy Commission, *Refining Estimates of Water-Related Energy Use in California, PIER Final Project Report (CEC-500-2006-118)*. Prepared
3. California Climate Action Registry, "Reporting Online Tool, Public Annual Entity Emissions," *Southern California Edison, PUP Report*, (2006),

Wastewater Treatment Process GHG Emissions[1]

Project	Maximum Population	Pounds BOD5 per Capita per Day[2] (lbs BOD5/capita/day)	Pounds CH_4 per Pound BOD5[3] (lbs CH_4/BOD5)	Fraction Anaerobically Digested[4]	Annual CO_2E Emissions (MT CO_2E/yr)
Net Project	439,923	0.13	0.22	0.15	**6,561.63**

Sources:

1. US Environmental Protection Agency, *Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, Volume I, Chapter 4.3.5*, (1998). Data is not available to determine CO_2
2. The US EPA recommends a default value of 0.13 lb BOD5/capita/day.
3. The US EPA recommends a default value of 0.22 lb CH_4/BOD5.
4. The US EPA recommends a default value of 15% for the fraction anaerobically digested for domestic wastewater.

Where:

BOD5	Biological oxygen demand using a standard 5 day test
CH_4	Methane
CO_2	Carbon dioxide
CO_2E	Carbon dioxide equivalent
GWP	Global warming potential
kW-hr	Kilowatt-hour
lbs	Pounds
MG	Million gallons
MT	Metric ton
N_2O	Nitrous oxide
yr	Year

27,127.28