4.11 ENERGY CONSERVATION

According to State CEQA Guidelines Section 15126.2(b), Section 15126.4 (a)(1)(C), and Appendix F, the goal of conserving energy implies the wise and efficient use of energy including decreasing reliance on natural gas and oil and increasing reliance on renewable energy sources (renewable energy is generally defined as energy that comes from resources which are naturally replenished within a human timescale such as sunlight, wind, tides, waves, and geothermal heat). The project would be constructed to Title 24 standards, which are designed to reduce energy demand in all new construction.

This section describes the existing setting of the project site as it relates to energy conservation; identifies associated regulatory conditions and requirements; presents the criteria used to evaluate potential impacts related to use of fuel and energy upon implementation of the project; and identifies mitigation measures to reduce or avoid each significant impact.

4.11.1 PROJECT ENERGY CONSUMPTION

Energy consumption is analyzed in this EIR due to the potential direct and indirect environmental impacts associated with the project. This section presents information on the existing energy consumption in the region and project vicinity. The following information serves as the baseline for assessing the project's impacts related to energy conservation.

CALIFORNIA'S ENERGY USE AND SUPPLY

Californians consumed 285,701-gigawatt hours (GWh)[1] of electricity in 2016, which is the most recent year for which data is available. Of this total, Solano County consumed 3,207 GWh.[2] In 2016, the California electricity mix included natural gas (33.67%), coal (4.13%), large hydroelectric plants (14.72%), and nuclear (9.08%). The remaining 29 percent was supplied from renewable resources, such as wind, solar, geothermal, biomass, and small hydroelectric facilities.[3] In 2017, the State consumed 2,110,829 million cubic feet[4] of natural gas.[5]

Energy usage is typically quantified using the British Thermal Unit (BTU). Total energy usage in California was 7,676 trillion BTU in 2015 (the most recent year for which this specific data is available), which equates to an average of 197 million BTU per capita. Of California's total energy usage, the breakdown by sector

[1] A watt hour is a unit of energy equivalent to one watt of power expended for one hour. For example, a typical light bulb is 60 watts, meaning that if it is left on for one hour, 60-watt hours have been used. One kilowatt equals 1,000 watts. The consumption of electrical energy by homes and businesses is usually measured in kilowatt hours (kWh). Some large businesses and institutions also use megawatt hours (MWh), where one MWh equals 1,000 kWh. One gigawatt equals 1,000 megawatts, or 1,000,000 kilowatts. The energy output of large power plants over long periods of time, or the energy consumption of jurisdictions, can be expressed in gigawatt hours (GWh).

[2] California Energy Commission (CEC), *Electricity and Natural Gas Consumption by County,* 2018.

[3] California Energy Commission (CEC), *Energy Almanac, California's Electricity Data*, 2018.

[4] 100 cubic feet (CCF) is approximately the energy equivalent to burning 100 cubic feet of natural gas. 100 CCF of natural gas equals 103,700 a British Thermal Unit (BTU). A BTU is the amount of energy needed to raise the temperature of one pound of water by one-degree Fahrenheit. A kBTU is 1,000 BTUs. A therm is 100,000 BTUs.

[5] U.S. EIA, *California Natural Gas Total Consumption*, 2018.

is 39 percent transportation, 24 percent industrial, 19 percent commercial, and 18 percent residential. Electricity and natural gas in California are generally consumed by stationary users such as residences and commercial and industrial facilities, whereas petroleum consumption is generally accounted for by transportation-related energy use.[6] In 2017, taxable gasoline sales (including aviation gasoline) in California accounted for 15,540,154,774 gallons of gasoline.[7]

In 2002, California established its Renewable Portfolio Standard program[8] with the goal of increasing the annual percentage of renewable energy in the State's electricity mix by the equivalent of at least 1 percent of sales, with an aggregate total of 20 percent by 2017. The California Public Utilities Commission subsequently accelerated that goal to year 2010 for retail sellers of electricity (*Public Utilities Code* §399.15(b)(1)). Then-Governor Schwarzenegger signed Executive Order S-14-08 in 2008, increasing the target to 33 percent renewable energy by 2020. In September 2009, then-Governor Schwarzenegger continued California's commitment to the Renewable Portfolio Standard by signing Executive Order S-21-09, which directs the California Air Resources Board (CARB) under its Assembly Bill (AB) 32 authority to enact regulations to help the State meet its Renewable Portfolio Standard goal of 33 percent renewable energy by 2020. In September 2010, the CARB adopted its Renewable Electricity Standard regulations, which require all of the State's load-serving entities to meet this target. In October 2015, then-Governor Jerry Brown signed into legislation Senate Bill (SB) 350, which requires retail sellers and publicly owned utilities to procure 50 percent of their electricity from eligible renewable energy resources by 2030. Signed in 2018, SB 100 revised the goal of the program to achieve the 50 percent renewable resources target by December 31, 2026, and to achieve a 60 percent target by December 31, 2030. SB 100 also established a further goal to have an electric grid that is entirely powered by clean energy by 2045.

Additional energy efficiency measures beyond the current regulations are needed to meet these goals as well as the AB 32 greenhouse gas (GHG) reduction goal of reducing statewide GHG emissions to 1990 levels by 2020 and 40 percent below 1990 levels by 2030 (see Chapter 4.6, Greenhouse Gas Emissions, for a discussion of AB 32 and SB 32). Part of the effort in meeting California's long-term reduction goals include reducing petroleum use in cars and trucks by 50 percent, increasing from one-third to one-half of California's electricity derived from renewable sources, doubling the efficiency savings achieved at existing buildings and making heating fuels cleaner; reducing the release of methane, black carbon, and other short-lived climate pollutants, and managing farm and rangelands, forests, and wetlands so they can store carbon.[9]

[6] EIA (US Energy Information Administration), California State Profile and Energy Estimates, updated April 19, 2018, http://www.eia.gov/state/data.cfm?sid=CA#ConsumptionExpenditures and https://www.eia.gov/state/seds/data.php?incfile=/state/seds/sep_fuel/html/fuel_te.html&sid=US&sid=CA, accessed March 4, 2019.

[7] California Board of Equalization, *Net Taxable Gasoline Sales*, 2016, http://www.cdtfa.ca.gov/taxes-and-fees/MVF_10_Year_Report.pdf, accessed March 4, 2019.

[8] The Renewable Portfolio Standard is a flexible, market-driven policy to ensure that the public benefits of wind, solar, biomass, and geothermal energy continue to be realized as electricity markets become more competitive. The policy ensures that a minimum amount of renewable energy is included in the portfolio of electricity resources serving a state or country.

[9] California Energy Commission (CEC), *Final Integrated Energy Policy Report Update,* 2016.

CURRENT ENERGY PROVIDERS

Electricity Provider

Currently, Pacific Gas and Electric Company (PG&E) provides electricity to Solano County businesses and residents. The PG&E 2016 power mix was as follows: 17 percent natural gas; 24 percent nuclear; 33 percent renewables; 12 percent large hydroelectric; 14 percent unspecified power.[10] As shown in *Table 4.11-1: Electricity Consumption in Solano County 2006-2017*, electricity consumption in Solano County has remained relatively constant between 2006 and 2017.

Table 4.11-1: Electricity Consumption in Solano County 2006-2017

Year	Electricity Consumption (in millions of kilowatt-hours)
2006	3,166
2007	3,341
2008	3,176
2009	3,175
2010	3,064
2011	3,122
2012	3,193
2013	3,229
2014	3,221
2015	3,216
2016	3,207
2017	3,203

Source: CEC, *Electricity Consumption by County,* 2018.
https://ecdms.energy.ca.gov/elecbycounty.aspx

Natural Gas Provider

PG&E operates one of the largest natural gas distribution networks in the country, including 42,141 miles of natural gas transmission and distribution pipelines.[11] In all, PG&E delivers gas to approximately 4.3 million customer accounts in Northern and Central California, including in Solano County. As shown in *Table 4.11-2: Natural Gas Consumption in Solano County 2006-2017*, natural gas consumption in Solano County has remained relatively constant between 2006 and 2017.

Table 4.11-2: Natural Gas Consumption in Solano County 2006-2017

Year	Natural Gas Consumption (in millions of therms)
2006	225
2007	205
2008	239
2009	220

[10] Pacific Gas & Electric (PG&E), *PG&E's 2016 Electric Power Mix Delivered to Retail Customers*, 2018.
[11] Pacific Gas & Electric (PG&E), *Company Profile,* 2018.

Year	Natural Gas Consumption (in millions of therms)
2010	226
2011	210
2012	217
2013	216
2014	229
2015	222
2016	254
2017	228

Source: CEC, *Natural Gas Consumption by County,* 2018.
https://ecdms.energy.ca.gov/gasbycounty.aspx

Transportation Fuel

California's transportation sector uses roughly half of the energy consumed in the State. In 2018, Californians consumed approximately 15.6 billion gallons of gasoline and 3.1 billion gallons of diesel fuel.[12] As shown in *Table 4.11-3: Automotive Fuel Consumption in Solano County 2009-2019*, on-road automotive fuel and heavy-duty diesel fuel consumption in Solano County has remained steady since 2009.

Table 4.11-3: Automotive Fuel Consumption in Solano 2009-2019

Year	Gasoline Fuel Consumption (Gallons)	Heavy-Duty Vehicle/Diesel Fuel Consumption (Gallons)
2009	188,513,362	47,719,882
2010	188,711,624	46,906,128
2011	183,745,173	47,874,745
2012	182,007,071	47,359,062
2013	182,198,737	48,658,392
2014	184,622,481	49,019,991
2015	189,624,741	49,377,350
2016	196,480,312	52,815,728
2017	191,239,545	52,995,438
2018 (projected)	187,821,236	53,175,715
2019 (projected)	184,198,298	53,425,413

Source: California Air Resources Board, EMFAC2017.

4.11.2 REGULATORY SETTING

The following is a description of State and local environmental laws and policies that are relevant to energy conservation. See also Chapter 4.2, Air Quality, Chapter 4.6, Greenhouse Gas Emissions, and

[12] California State Board of Equalization (BOE), *Net Taxable Gasoline Gallons*, 2018 and California State Board of Equalization (BOE), *Taxable Diesel Gallons 10-year Report,* 2018.

Chapter 4.15, Transportation and Circulation, for other policies related to energy use. See Chapter 4.16, Utilities and Service Systems for policies related to water consumption.

FEDERAL

National Energy Conservation Policy Act

The National Energy Conservation Policy Act serves as the underlying authority for federal energy management goals and requirements. Signed into law in 1978, it has been regularly updated and amended by subsequent laws and regulations. This act is the foundation of most federal energy requirements.

Energy Policy Act of 2005

The Energy Policy Act of 2005 sets equipment energy efficiency standards and seeks to reduce reliance on non-renewable energy resources and provide incentives to reduce current demand on these resources. For example, under the act, consumers and businesses can attain federal tax credits for purchasing fuel-efficient appliances and products, including hybrid vehicles; constructing energy-efficient buildings; and improving the energy efficiency of commercial buildings. Additionally, tax credits are available for the installation of qualified fuel cells, stationary micro-turbine power plants, and solar power equipment.

Energy and Independence Security Act of 2007

The Energy and Independence Security Act of 2007 sets federal energy management requirements in several areas, including energy reduction goals for federal buildings, facility management and benchmarking, performance standards for new buildings and major renovations, high-performance buildings, energy savings performance contracts, metering, energy-efficient product procurement, and reduction in petroleum use and increase in alternative fuel use. This act also amends portions of the National Energy Policy Conservation Act.

STATE

Assembly Bill 32 and Senate Bill 32

California's major initiative for reducing GHG emissions is outlined in AB 32, the "California Global Warming Solutions Act of 2006." AB 32 codifies the statewide goal of reducing GHG emissions to 1990 levels by 2020 (essentially a 15 percent reduction below 2005 emission levels; the same requirement as under S-3-05) and requires CARB to prepare a Scoping Plan that outlines the main State strategies for reducing GHGs to meet the 2020 deadline. In addition, AB 32 requires CARB to adopt regulations to require reporting and verification of statewide GHG emissions. Reductions in overall energy consumption have been implemented to reduce emissions. See Chapter 4.6 (Greenhouse Gas) for a further discussion of AB 32.

In September 2016, the Governor signed into legislation SB 32, which builds on AB 32 and requires the state to cut GHG emissions to 40 percent below 1990 levels by 2030. With SB 32, the Legislature also passed AB 197, which provides additional direction for updating the Scoping Plan to meet the 2030 GHG

reduction target codified in SB 32. CARB has published a draft update to the Scoping Plan and has received public comments on this draft but has not released the final version.

Additional energy efficiency measures beyond the current regulations are needed to meet these goals as well as the AB 32 greenhouse gas (GHG) reduction goal of reducing statewide GHG emissions to 1990 levels by 2020 and the SB 32 goal of 40 percent below 1990 levels by 2030 (see Chapter 4.6, Greenhouse Gas, for a discussion of AB 32 and SB 32). Part of the effort in meeting California's long-term reduction goals include reducing petroleum use in cars and trucks by 50 percent, increasing from one-third to more than one-half of California's electricity derived from renewable sources, doubling the efficiency savings achieved at existing buildings and making heating fuels cleaner; reducing the release of methane, black carbon, and other short-lived climate pollutants, and managing farm and rangelands, forests, and wetlands so they can store carbon.[13]

Building Energy Efficiency Standards

The Energy Efficiency Standards for Residential and Nonresidential Buildings, as specified in Title 24, Part 6, of the California Code of Regulations, were established in 1978 in response to a legislative mandate to reduce California's energy consumption. The standards are updated periodically to allow consideration and possible incorporation of new energy efficiency technologies and methods. The 2019 Building Energy Efficiency Standards were adopted on May 9, 2018 and take effect on January 1, 2020. Under the 2019 standards, homes will use about 53 percent less energy and nonresidential buildings will use about 30 percent less energy than buildings under the 2016 standards.

California Green Building Standards Code

The California Green Building Standards Code (California Code of Regulations, Title 24, Part 11), commonly referred to as the CALGreen Code, is a statewide mandatory construction code that was developed and adopted by the California Building Standards Commission and the California Department of Housing and Community Development. CALGreen standards require new residential and commercial buildings to comply with mandatory measures under five topical areas: planning and design; energy efficiency; water efficiency and conservation; material conservation and resource efficiency; and environmental quality. CALGreen also provides voluntary measures (CALGreen Tier 1 and Tier 2) that local governments may adopt which encourage or require additional measures in the five green building topics. The most recent update to the CALGreen Code was adopted in 2019 and becomes effective January 1, 2020.

Among the key mandatory provisions are requirements that new buildings:

- Reduce indoor potable water use by at least 20 percent below current standards;
- Recycle or salvage at least 50 percent of construction waste;
- Utilize low VOC-emitting finish materials and flooring systems;
- Install separate water meters tracking non-residential buildings' indoor and outdoor water use;

[13] California Energy Commission (CEC), *Final Integrated Energy Policy Report Update,* 2016.

- Utilize moisture-sensing irrigation systems for larger landscape areas;
- Receive mandatory inspections by local officials of building energy systems, such as heating, ventilation, and air conditioning (HVAC) and mechanical equipment, to verify performance in accordance with specifications in non-residential buildings exceeding 10,000 square feet; and
- Earmark parking for fuel-efficient and carpool vehicles.

2008 California Energy Action Plan Update

The *2008 Energy Action Plan Update* provides a status update to the *2005 Energy Action Plan II,* which is the State of California's principal energy planning and policy document (CPUC and CEC, 2008). The plan continues the goals of the original *Energy Action Plan*, describes a coordinated implementation plan for State energy policies, and identifies specific action areas to ensure that California's energy is adequate, affordable, technologically advanced, and environmentally sound. First-priority actions to address California's increasing energy demands are energy efficiency, demand response (i.e., reduction of customer energy usage during peak periods in order to address system reliability and support the best use of energy infrastructure), and the use of renewable sources of power. If these actions are unable to satisfy the increasing energy and capacity needs, the plan supports clean and efficient fossil-fired generation.

2006 Appliance Efficiency Regulations

The California Energy Commission adopted Appliance Efficiency Regulations (Title 20, California Code of Regulations §§ 1601 through 1608) on October 11, 2006. The regulations were approved by the California Office of Administrative Law on December 14, 2006. The regulations include standards for both federally regulated appliances and non-federally regulated appliances. While these regulations are now often viewed as "business-as-usual," they exceed the standards imposed by all other states and they reduce GHG emissions by reducing energy demand.

Senate Bill 1078 and 107; Executive Order S-14-08, S-21-09, and SB 2X

SB 1078 (Chapter 516, Statutes of 2002) requires retail sellers of electricity, including investor-owned utilities and community choice aggregators, to provide at least 20 percent of their supply from renewable sources by 2017. SB 107 (Chapter 464, Statutes of 2006) changed the target date to 2010. In November 2008, then-Governor Schwarzenegger signed Executive Order S-14-08, which expands the State's Renewable Portfolio Standard to 33 percent renewable power by 2020. In September 2009, then-Governor Schwarzenegger continued California's commitment to the Renewable Portfolio Standard by signing Executive Order S-21-09, which directs the CARB under its AB 32 authority to enact regulations to help the State meet its Renewable Portfolio Standard goal of 33 percent renewable energy by 2020. In April 2011, Governor Brown signed SB 2X, which legislated the prior Executive Order S-14-08 renewable standard.

Executive Order B-30-15, Senate Bill 350, and Senate Bill 100

In April 2015, the Governor issued Executive Order B-30-15, which established a GHG reduction target of 40 percent below 1990 levels by 2030. SB 350 (Chapter 547, Statutes of 2015) advanced these goals through two measures. First, the law increases the renewable power goal from 33 percent renewables by 2020 to 50 percent by 2030. Second, the law requires the CEC to establish annual targets to double energy efficiency in buildings by 2030. The law also requires the California Public Utilities Commission (CPUC) to direct electric utilities to establish annual efficiency targets and implement demand-reduction measures to achieve this goal. In 2018, SB 100 revised the goal of the program to achieve the 50 percent renewable resources target by December 31, 2026, and to achieve a 60 percent target by December 31, 2030. SB 100 also established a further goal to have an electric grid that is entirely powered by clean energy by 2045.

LOCAL

Propel Vallejo General Plan 2040

The City of Vallejo General Plan lists the following goals and policies related to energy consumption:

Policy NBE-1.15 Energy Efficiency.	Support measures to reduce energy consumption and increase energy efficiency in residential, commercial, industrial, and public buildings.
Action NBE-1.15A	Connect businesses and residents with voluntary programs that provide free or low-cost energy efficiency audits, retrofit installations, rebates, financing and contractors.
Action NBE-1.15B	Participate in regional energy efficiency financing programs such as low-interest revolving loan funds, the California Comprehensive Residential Building Retrofit Program, California First, and the Property Assessed Clean Energy (PACE) program that enable Vallejo property owners to obtain low-interest financing for energy improvements.
Action NBE-1.15C	Consider creating a Residential Energy Conservation Ordinance (RECO) and Commercial Energy Conservation Ordinance (CECO) to require point-of-sale energy audits and retrofits for all buildings that do not meet minimum energy efficiency requirements.

City of Vallejo Municipal Code

Municipal Code Section 12.48.010 adopts the 2016 California Green Building Standards.

4.11.3 STANDARDS OF SIGNIFICANCE

SIGNIFICANCE CRITERIA AND THRESHOLDS

The environmental analysis in this section is patterned after the Initial Study Checklist recommended by the *CEQA* Guidelines. The issues presented in the Initial Study Checklist have been utilized as thresholds of significance in this section. Accordingly, a project may create a significant environmental impact if it causes one or more of the following to occur:

- Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation.
- Conflict with or obstruct State or local plan for renewable energy or energy efficiency.

The analysis below generally follows Appendix F of the State CEQA Guidelines, which states that the goal of conserving energy implies the wise and efficient use of energy, including decreasing overall per capita energy consumption, decreasing reliance on fossil fuels, and increasing reliance on renewable energy sources. According to Appendix F, the analysis should include a description of energy conservation measures included as part of the project and should consider whether a project would result in inefficient, wasteful and unnecessary consumption of energy.

METHODOLOGY

In determining whether implementation of the project would result in the inefficient, wasteful or unnecessary consumption of fuel or energy, this analysis considers the recommendations of Appendix F (as described above), which states that environmental impact analyses of energy conservation may include:

1. The project's energy requirements and its energy use efficiencies by amount and fuel type for each stage of the project's life cycle including construction, operation, maintenance and/or removal. If appropriate, the energy intensiveness of materials may be discussed.
2. The effects of the project on local and regional energy supplies and on requirements for additional capacity.
3. The degree to which the project complies with existing energy standards.
4. The effects of the project on energy resources.
5. The project's projected transportation energy use requirements and its overall use of efficient transportation alternatives.

This section analyzes energy consumption on three sources of energy that are relevant to the project: electricity, natural gas, and transportation fuel for vehicle trips associated with new development, as well as the fuel necessary for project construction. The analysis of project electricity/natural gas usage is based on California Emissions Estimator Model (CalEEMod) modeling, which quantifies energy use for occupancy. The results of the CalEEMod modeling are included in Appendix C (Air Quality and GHG Data)

of this EIR. Modeling related to project energy consumption was based primarily on the default settings in the computer program for Solano County. The amount of operational fuel use was estimated using CalEEMod outputs for the project and CARB's Emissions Factor 2017 (EMFAC2017) computer program for typical daily fuel usage in Solano County. Construction fuel consumption was calculated based on CalEEMod emissions outputs and conversion ratios from the Climate Registry. The results of EMFAC2017 modeling and construction fuel estimates are included in Appendix C, *Air Quality and GHG Data*.

4.11.4 ENERGY CONSUMPTION

IMPACT ENG-1	***WOULD THE PROJECT RESULT IN POTENTIALLY SIGNIFICANT ENVIRONMENTAL IMPACT DUE TO WASTEFUL, INEFFICIENT, OR UNNECESSARY CONSUMPTION OF ENERGY RESOURCES, DURING PROJECT CONSTRUCTION OR OPERATION?*** ***(LESS THAN SIGNIFICANT IMPACT)***

CONSTRUCTION (SHORT-TERM)

The energy consumption associated with buildout of the project includes electricity usage associated with water usage for dust control, diesel fuel consumption from on-road hauling trips and off-road construction diesel equipment, and gasoline consumption from on-road worker commute and vendor trips. The methodology for each category is discussed below. This analysis relies on the construction equipment list and operational characteristics, as stated in Chapter 4.2, Air Quality, and Chapter 4.6, Greenhouse Gas Emissions, as well as Appendix C of this Draft EIR. Quantifications of construction energy consumption are provided for the project.

Electricity Usage

Electricity usage associated with water consumption for construction dust control is calculated based on total water consumption and the energy intensity for supply, distribution, and treatment of water. The total number of gallons of water usage is calculated based on acreage disturbed during grading and site preparation, as well as the daily water consumption rate per acre disturbed.

- The total acres disturbed are calculated using the methodology described in Chapter 4.2 of Appendix A of the CalEEMod User's Guide (Grading Equipment Passes).
- The water application rate of 3,020 gallons per acre per day is from Air & Waste Management Association's Air Pollution Engineering Manual.

The energy intensity value is based on the CalEEMod default energy intensity per gallon of water for Solano County. As summarized in *Table 4.11-4: Project Energy Consumption During Construction*, the total electricity consumption associated with water consumption for construction dust control would be approximately 74,820 kWh (74.8 megawatt hours [MWh]) during site preparation and grading of the project.

Table 4.11-4: Project Energy Consumption During Construction

Source	Project Construction Usage	Solano County Annual Energy Consumption	Percentage Increase Countywide
Electricity Use	**Megawatt Hours (MWh)**		
Water Consumption [a]	74.8	3,203,000	0.0023%
Diesel Use	**Gallons**		
On-Road Construction Trips [b]	149,144	52,995,438	0.281%
Off-Road Construction Equipment [c]	187,418		0.354%
Construction Diesel Total	**336,562**		**0.635%**
Gasoline	**Gallons**		
On-Road Construction Trips [b]	117,888	191,239,545	0.062%

Notes:
a. Construction water use estimated based on acres disturbed per day per construction sequencing and estimated water use per acre (AWMA 1992).
b. On-road mobile source fuel use based on vehicle miles traveled (VMT) from CalEEMod and fleet-average fuel consumption in gallons per mile from EMFAC2017 in Solano County.
c. Construction fuel consumption was calculated based on CalEEMod emissions outputs and conversion ratios from the Climate Registry.
Abbreviations:
CalEEMod: California Emission Estimation Model; EMFAC: Emission Factor Model 2017; kWh: kilowatt-hour; MWh: megawatt-hour.
Sources: AWMA, 1992; DOE 2016; USEPA 1996.

Diesel Usage: On-Road Construction Trips

The diesel usage associated with on-road construction mobile trips is calculated based on vehicle miles traveled (VMT) from vehicle trips (i.e., worker, vendor, and hauling), the CalEEMod default diesel fleet percentage, and vehicle fuel efficiency in miles per gallon. VMT for the entire construction period is calculated based on the total daily trips (refer to Chapter 4.6, Greenhouse Gas). Construction fuel consumption was calculated based on CalEEMod emissions outputs and conversion ratios from the Climate Registry. As summarized in Table 4.11-4, the total diesel consumption associated with on-road construction trips would be approximately 149,144 gallons over the duration of buildout of the project.

Diesel Usage: Off-Road Construction Equipment

The construction diesel usage associated with the off-road construction equipment is calculated based on CalEEMod emissions outputs and conversion ratios from the Climate Registry. As summarized in Table 4.11-4, the total diesel consumption associated with off-road construction equipment is approximately 187,418 gallons for duration of buildout of the project.

Gasoline Usage

Gasoline use associated with on-road construction mobile trips is calculated based on VMT from vehicle trips (i.e., worker, vendor, and hauling); the CalEEMod default gasoline fleet percentage; and vehicle fuel efficiency in miles per gallon using the same methodology as the construction on-road trip diesel usage calculation discussed above. The total gasoline consumption associated with on-road construction trips would be approximately 117,888 gallons over the duration of buildout of the project (Table 4.11-4).

In total, construction of the project is estimated to consume approximately 74,820 kWh (74.8 MWh) of electricity, 336,562 gallons of diesel, and 117,888 gallons of gasoline. As indicated in the environmental setting above, Californians consumed 285,701 GWh of electricity in 2016, of which Solano

County consumed 3,203 GWh. Therefore, construction electricity consumption would represent approximately $2.6x10^{-5}$ percent of the electricity consumption in the State, and 0.0023 percent of the electricity consumption in Solano County.

In 2015, Californians consumed approximately 15.1 billion gallons of gasoline and 3 billion gallons of diesel fuel. Solano County annual diesel consumption in 2017 was 52,995,438 gallons and gasoline consumption was 191,239,545 gallons. Project construction gasoline consumption would represent 0.062 percent of annual gasoline consumption in the County, and construction diesel consumption would represent 0.635 percent of annual diesel consumption in the County. Therefore, based on the project's relatively low construction fuel use proportional to State and County consumption, the project would not substantially affect existing energy or fuel supplies or resources. New capacity/additional sources of construction fuel are not anticipated to be required.

Furthermore, there are no unusual project characteristics that would necessitate the use of construction equipment that would be less energy-efficient than at comparable construction sites in the region or State. In addition, some incidental energy conservation would occur during construction through compliance with State requirements that equipment not in use for more than five minutes be turned off. Project construction equipment would also be required to comply with the latest U.S. EPA and CARB engine emissions standards. These engines use highly efficient combustion engines to minimize unnecessary fuel consumption.

The proposed project has construction activities that would consume energy, primarily in the form of diesel fuel (e.g., mobile construction equipment) and electricity (e.g., power tools). Construction activities would be required to monitor air quality emissions using applicable regulatory guidance such as the BAAQMD Rules and CEQA Guidelines. This requirement indirectly relates to construction energy conservation because when air pollutant emissions are reduced as a result of monitoring and the efficient use of equipment and materials, this results in reduced energy consumption. There are no aspects of the proposed project that would foreseeably result in the inefficient, wasteful, or unnecessary consumption of energy during construction activities.

Due to increasing transportation costs and fuel prices, contractors and owners have a strong financial incentive to avoid wasteful, inefficient, and unnecessary consumption of energy during construction. There is growing recognition among developers and retailers that sustainable construction is not prohibitively expensive, and that there is a significant cost-savings potential in green building practices and materials. Substantial reductions in energy inputs for construction materials can be achieved by selecting building materials composed of recycled materials that require substantially less energy to produce than non-recycled materials. The project-related incremental increase in the use of energy bound in construction materials such as asphalt, steel, concrete, pipes, and manufactured or processed materials (e.g., lumber and gas) would not substantially increase demand for energy compared to overall local and regional demand for construction materials. It is reasonable to assume that production of building materials such as concrete, steel, etc., would employ all reasonable energy conservation practices in the interest in minimizing the cost of doing business.

As described above, the project's fuel from the entire construction period would increase fuel use in the County by less than one percent. It should be noted that the CEQA Guideline Appendix G and Appendix F criteria requires the project's effects on local and regional energy supplies and on the requirements for additional capacity to be addressed. A less than one percent increase in construction fuel demand is not anticipated to trigger the need for additional capacity. Additionally, use of construction fuel would be temporary and would cease once the project is fully developed. As such, project construction would have a nominal effect on local and regional energy supplies.

There are no unusual project characteristics that would necessitate the use of construction equipment that would be less energy-efficient than at comparable construction sites in the region or State. Therefore, it is expected that construction fuel consumption associated with the project would not be any more inefficient, wasteful, or unnecessary than other similar development projects of this nature. Therefore, potential impacts are considered less than significant.

OPERATIONAL (LONG-TERM)

The energy consumption associated with project operations would occur from building energy (electricity and natural gas) use, water consumption, and transportation-related fuel consumption. The methodology for each category is discussed below. Note that this energy resources analysis is consistent with the analysis presented in Chapter 4.2, Air Quality, and Chapter 4.6, Greenhouse Gas. Quantifications of operational energy consumption are provided for the proposed project.

Transportation Energy Demand

Gasoline and diesel usage associated with on-road vehicular trips were calculated based on total VMT calculated for the analyses within Chapter 4.2, Air Quality, and Chapter 4.6, Greenhouse Gas, and average fuel efficiency from EMFAC2017 model. The EMFAC2017 fuel efficiency data incorporate the Pavley Clean Car Standards and the Advanced Clean Cars Program.[14] As summarized in *Table 4.11-5: Project Annual Energy Consumption During Operations*, the total gasoline and diesel consumption associated with on-road trips would be approximately 307,184 gallons per year and 69,861 gallons per year, respectively.

Table 4.11-5: Project Annual Energy Consumption During Operations

Source	Project Operational Usage	Solano County Annual Energy Consumption	Percentage Increase Countywide
Electricity Use		**Megawatt Hour/Year (MWh/year)**	
Building [a]	2,475	3,203,000	0.0773%
Water [a]	160		0.005%
Total Electricity	**2,635**		0.0823%
Natural Gas Use		**Therms/year**	
Building [a]	57,170	254,000,000	0.023%
Diesel Use		**Gallons/Year**	
Mobile [b]	69,861	52,995,438	0.132%

[14] The California Air Resources Board EMFAC 2017 Technical Documentation (March 2018) notes that emissions are estimated with all current controls active, except Low Carbon Fuel Standards (LCFS). The reason for excluding LCFS is that most of the emissions benefits due to the LCFS come from the production cycle (upstream emissions) of the fuel rather than the combustion cycle (tailpipe). As a result, LCFS is assumed to not have a significant impact on CO_2 emissions from EMFAC's tailpipe emission estimates.

Source	Project Operational Usage	Solano County Annual Energy Consumption	Percentage Increase Countywide
Gasoline Use		**Gallons/Year**	
Mobile [b]	307,184	191,239,545	0.161%

Notes:
a. The electricity, natural gas, and water usage are based on project-specific estimates and CalEEMod defaults.
b. Calculated based on the mobile source fuel use based on vehicle miles traveled (VMT) and fleet-average fuel consumption (in gallons per mile) from EMFAC2017.

Abbreviations: CalEEMod: California Emission Estimation Model; EMFAC2017: California Air Resources Board Emission Factor Model; kBTU: thousand British Thermal Units; kWh: kilowatt-hour; MWh: Megawatt-hour.

Electricity Usage

The electricity usage associated with project operations is based on CalEEMod defaults. As summarized in Table 4.11-5, the single-family residential, retail uses, and parking areas is forecasted to use 2,475 MWh (approximately 2.48 GWh) of electricity per year.

The electricity usage associated with operational water consumption is estimated based on the annual water consumption, and the energy intensity factor is the CalEEMod default energy intensity per gallon of water for Solano County. Project area water use is based on the water demand per square foot factors in CalEEMod. Proposed project land uses would use approximately 34.7 million gallons (20.1 million gallons for indoor uses and 14.6 million gallons for outdoor uses) of water annually which would require 159,810 kWh per year for conveyance and treatment.

Natural Gas Usage

The methodology used to calculate the natural gas usage associated with the building envelopes constructed pursuant to the project is based on CalEEMod default usage rates. As summarized in Table 4.11-5, the building envelope would require 5,716,983 thousand British Thermal Units (kBTU) (57,170 therms) of natural gas per year.

Operation of uses implemented pursuant to the project would annually consume approximately 2.64 GWh of electricity, 5,717 million BTU of natural gas, 69,861 gallons of diesel, and 307,184 gallons of gasoline.

Californians consumed 285,701 GWh of electricity in 2016, of which Solano County consumed 3,203 GWh. The project's operational electricity consumption would represent 0.001 percent of the electricity consumption in the State, and 0.0823 percent of the energy consumption in Solano County. Regarding natural gas, Californians consumed 12,739 million therms (or 1,273.9 billion kBTUs) of natural gas and 254 million therms of natural gas in Solano County in 2016. Therefore, the project's operational natural gas consumption would represent 3.2×10^{-6} percent of the natural gas consumption in the State and 0.023 percent of the natural gas consumption in the County.

In 2015, Californians consumed approximately 15.1 billion gallons of gasoline and 3 billion gallons of diesel fuel. Project operational consumption of gasoline and diesel would represent 0.005 percent of gasoline and 0.006 percent of diesel consumption statewide. Project operational consumption of gasoline and diesel would represent 0.427 percent of gasoline and 0.350 percent of diesel consumption in the County.

Therefore, project operations would not substantially affect existing energy or fuel supplies or resources. The project would comply with applicable energy standards and new capacity would not be required. Impacts would be less than significant in this regard.

Energy Efficiency Measures

As discussed above, California's Energy Efficiency Standards for Residential and Non-residential Buildings create uniform building codes to reduce California's energy consumption and provide energy efficiency standards for residential and non-residential buildings. These standards are incorporated within the California Building Code and are expected to substantially reduce the growth in electricity and natural gas use. For example, requirements for energy-efficient lighting, heating and cooling systems, and green building materials are expected to save additional electricity and natural gas. These savings are cumulative, doubling as years go by.

Furthermore, the electricity provider, PG&E, is subject to California's Renewables Portfolio Standard (RPS). The RPS requires investor-owned utilities, electric service providers, and community choice aggregators to increase procurement from eligible renewable energy resources to 33 percent of total procurement by 2020 and to 50 percent of total procurement by 2030. SB 100 revised the goal of the program to achieve the 50 percent renewable resources target by December 31, 2026, and to achieve a 60 percent target by December 31, 2030. SB 100 also established a further goal to have an electric grid that is entirely powered by clean energy by 2045. Renewable energy is generally defined as energy that comes from resources which are naturally replenished within a human timescale such as sunlight, wind, tides, waves, and geothermal heat. As discussed in Chapter 4.6, Greenhouse Gas, Mitigation Measure GHG-10 requires the project applicant to demonstrate that the Costco store has been designed to accommodate rooftop solar panels and that within 4 years of occupancy, the Costco store must install rooftop solar panels or another renewable energy source that generates at least 500,000-kilowatt hours per year.

The project would be required to comply with all federal, State, and local requirements for energy efficiency, including the latest Title 24 standards. The project would not result in the inefficient, wasteful, or unnecessary consumption of building energy. Therefore, potential impacts are considered less than significant.

The project would be required to comply with the latest State Building Code (Title 24, Part 6 of the California Code of Regulations), which further minimize energy consumption towards the California Long-Term Energy Efficiency Strategic Plan's (CEESP) goal to have 100 percent of new homes achieve zero net energy. The current (2016) Building Code approved by the California Energy Commission reduces energy use in new homes by 28 percent compared to the previous (2013) version of the code. As noted above, the 2019 Building Energy Efficiency Standards take effect on January 1, 2020. Under the 2019 standards, homes are expected to use about 53 percent less energy and nonresidential buildings about 30 percent less energy than buildings under the 2016 standards. These efficiency standards are included in the CalEEMod calculations for the project.

Additionally, the California Plumbing and Green Building Codes require water-efficient fixtures that would reduce water consumption and water-related energy use. For example, the code requires automatic irrigation systems utilizing weather and/or soil moisture-based irrigation controllers. The code also requires the installation of high-efficiency toilets (HET) with a maximum of 1.28 gallons per flush, install kitchen faucets, bath faucets, and shower heads that are 20 percent more efficient than typical low-flow plumbing fixtures.

In an effort to reduce energy consumption and promote sustainability, Costco incorporates various energy-saving measures when constructing a new facility. These practices are identified in Chapter 4.6, Greenhouse Gas, of this EIR.

The single-family residential, commercial, and open space uses would serve local community needs by providing a housing source near major roadways such as I-80 and Admiral Callaghan Lane. The project site is located near a major commercial center in the City. Energy would be minimized due to the proposed project's proximity to commercial and office uses which can result in reduced vehicle trips. The site has been designed to provide on-site recreational amenities such as parks and open space. All revegetation and landscaping would comply with the Solano County Landscape Design Guidelines including use of native species, which would minimize landscaping water and reduce water energy consumption.

Considering these requirements in addition to the project design features described above, the project would not result in the inefficient, wasteful, or unnecessary consumption of energy. Therefore, potential impacts are considered less than significant.

IMPACT ENG-2	***WOULD THE PROJECT CONFLICT WITH OR OBSTRUCT STATE OR LOCAL PLAN FOR RENEWABLE ENERGY OR ENERGY EFFICIENCY?*** ***(LESS THAN SIGNIFICANT IMPACT)***

Project design and operation would comply with State Building Energy Efficiency Standards, appliance efficiency regulations, and green building standards. As discussed above in Impact ENG-1, project development would not cause inefficient, wasteful and unnecessary energy consumption, and impacts would be less than significant. The City of Vallejo adopted a Climate Action Plan (CAP) in 2012 in order to help reduce energy consumption and GHG emissions to become a more sustainable community and to meet the goals of AB 32. The CAP outlines various measures and strategizes numerous methods on how the City's long-term vision can be achieved. A CAP Compliance Checklist completed for the project is included in Appendix C of this EIR. This checklist demonstrates the project's compliance with the City's CAP.

The commercial components of the proposed project would include design features such as pre-manufactured metal wall panels with insulation that carry a higher R-Value and greater solar reflectivity to help conserve energy, reflective cool roof material, high-efficiency restroom fixtures and HVAC units, and reclaim tanks used to capture heat released by refrigeration equipment to heat domestic water rather than releasing outside. Additional energy efficiency and energy saving measures are discussed above in

Impact ENG-1. These measures, in addition to the mitigation measures included in Chapter 4.6, Greenhouse Gas, implement energy-efficient designs and fixtures, incorporate renewable energy into the project, and would reduce overall energy consumption. Therefore, the project is consistent with AB 32, which aims to reduce energy consumption and subsequently decrease emissions statewide to 1990 levels by 2020. As such the project is consistent with regulations such as the State's RPS and Title 24 which are aimed at increasing the use of renewable energy and energy-efficient buildings, respectively. Impacts are considered less than significant.

Bay Area MTC's RTP/SCS Plan Bay Area 2040 integrates transportation, land use and housing to meet GHG reduction targets set by CARB. The most recent plan was adopted in July 2017. Plan Bay Area 2040 establishes GHG emissions goals for automobiles and light-duty trucks for 2020 and 2035 as well as an overall GHG target for the project region consistent with both the target date of AB 32 and the post-2020 GHG reduction goals of EOs 5-03-05, B-30-15, and SB 32. The proposed project is located near major roadways and is proximate to several major employers. Additionally, Mitigation Measure TR-4 (refer to Chapter 4.15, Transportation) requires a new SolTrans pull out. Existing transit stops along Admiral Callaghan Lane and Turner Parkway connect the project site to other parts of the City including downtown Vallejo and the Vallejo Transit Center. Increasing residential land uses near major employment centers is a key strategy for reducing regional VMT. The reduction in VMT would result in a corresponding reduction in transportation fuel consumption. Mitigation measures included in Chapter 4.6, Greenhouse Gas related to reducing travel demand would contribute to a reduction in reducing project VMT and energy consumption. Therefore, the project would be consistent with regional goals to reduce trips and VMT. Potential impacts are considered less than significant, and no mitigation is required.

4.11.5 CUMULATIVE IMPACTS

Construction and operations associated with implementation of the project would result in the consumption of fuel and energy, but it would not do so in a wasteful manner. The consumption of fuel and energy would not be substantial in comparison to statewide electricity, natural gas, gasoline, and diesel demand (Table 4.11-4 and Table 4.11-5). New capacity or supplies of energy resources would not be required. Additionally, the project would be subject to compliance with all federal, State, and local requirements for energy efficiency.

The anticipated project impacts, in conjunction with cumulative development in the area, would increase urbanization and result in increased energy consumption. As noted above, the project would not result in significant energy consumption impacts. The project would not be considered inefficient, wasteful, or unnecessary with regard to energy. No known past, present, or reasonably foreseeable projects would compound or increase the project's energy consumption. Thus, cumulative energy impacts from related projects, in conjunction with project-specific energy consumption, would not be cumulatively significant. Therefore, potential impacts are considered less than significant.

4.11.6 REFERENCES

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