CoreSite – Santa Clara Data Center SV9

Energy Study

prepared for

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1 Project Description and Impact Summary

1.1 Introduction

This study analyzes the potential energy impacts of the proposed CoreSite - Santa Clara Data Center SV9 Project (herein referred to as "proposed project" or "project") in Santa Clara, California. Rincon Consultants, Inc. (Rincon) prepared this study for Circlepoint, for use in support of environmental documentation being prepared for the project pursuant to the California Environmental Quality Act (CEQA). The purpose of this study is to analyze the project's energy impacts related to both temporary construction activity and long-term operation of the project.

Project Location

The approximately four-acre project site is in the City of Santa Clara, in the Silicon Valley region of the larger San Francisco Bay Area. The project site is in central Santa Clara, south of US Highway 101 (US-101) and west of the San Tomas Expressway. Figure 1 shows the project site's regional location. Land use designations surrounding the project site consist of Light Industrial and Planned Industrial to the west, south, and east; Low Intensity Office/Research and Development to the north, and High Intensity Office/Research and Development farther to the west.

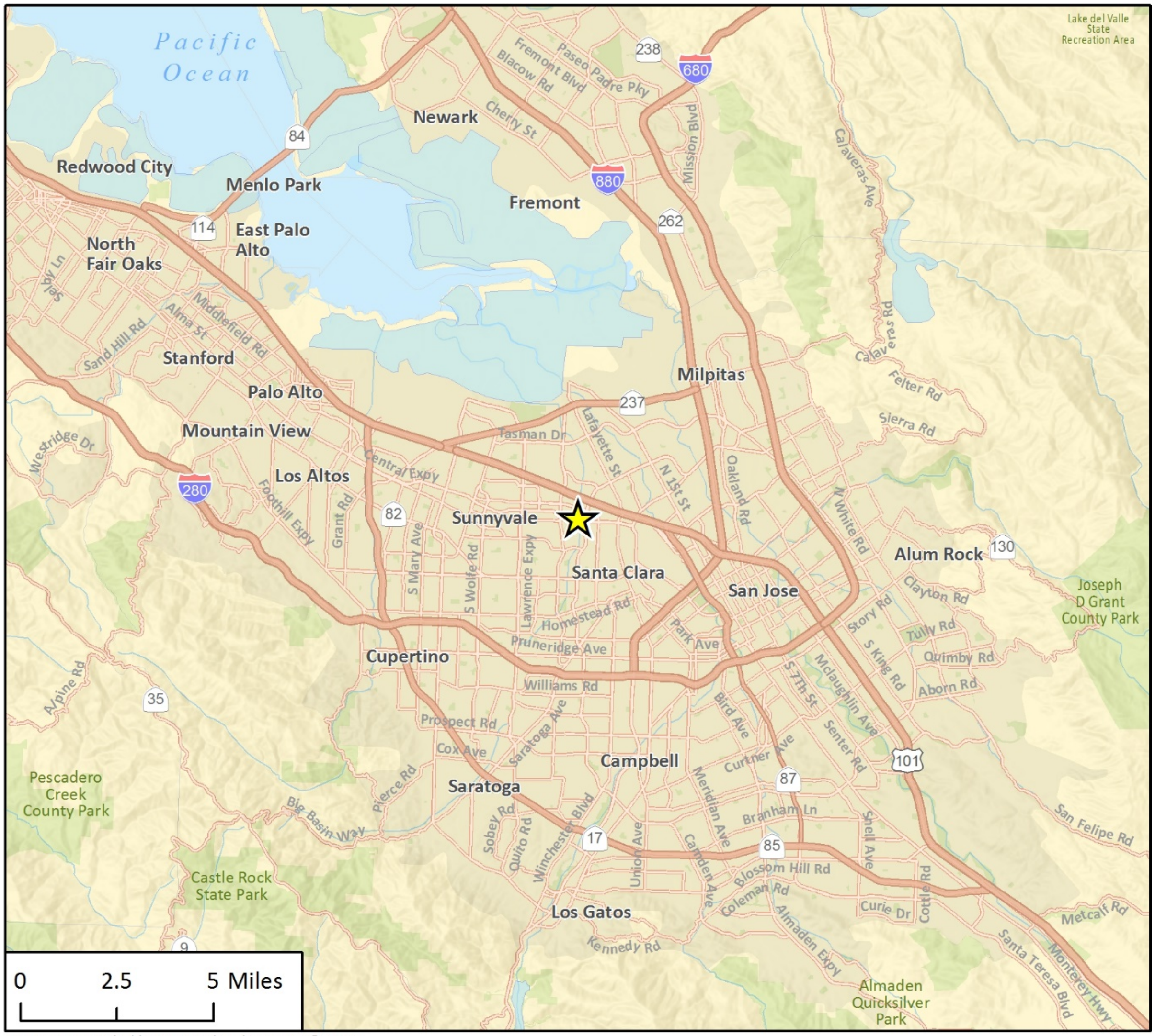
Surrounding development consists mainly of one- to five-story buildings with large surface parking lots. Nearby uses include data centers, research and development buildings, biotech companies and other digital technology-oriented uses. Buildings are generally set back from the street by landscaped areas, fencing and surface parking. Street-side trees occur intermittently throughout the area, often breaking up views of existing buildings from the street.

The project site is bound by Central Expressway to the south, Stender Way to the west, adjacent buildings to the north, and San Tomas Aquino Creek to the east. CoreSite's SV3, SV4, SV5, SV6, SV7, and SV8 data centers are immediately west of the project site along Stender Way and Coronado Drive. Corporate offices for ON Semiconductor (semiconductor supplier) are immediately to the north while San Tomas Aquino Creek and bike trail is to the east. There are various offices for Allegion, Crystal Instruments, AccuImage and Sentek Dynamics further to the east across the creek on Owen Street. Figure 2 shows an aerial view of the project location and immediate surroundings.

Site Conditions

The project site is developed with a single-story light industrial building and parking lot. The building is currently in use by several tenants leasing space. The existing building is set back from the roadway and parcel lines on all sides, and is surrounded on the west, north, and east sides with surface parking. The southern side of the building is set back from Central Expressway with landscaping, trees and a paved pedestrian walkway. The topography of the project site is relatively flat, with slight mounding around landscaping.

Figure 1 Regional Location



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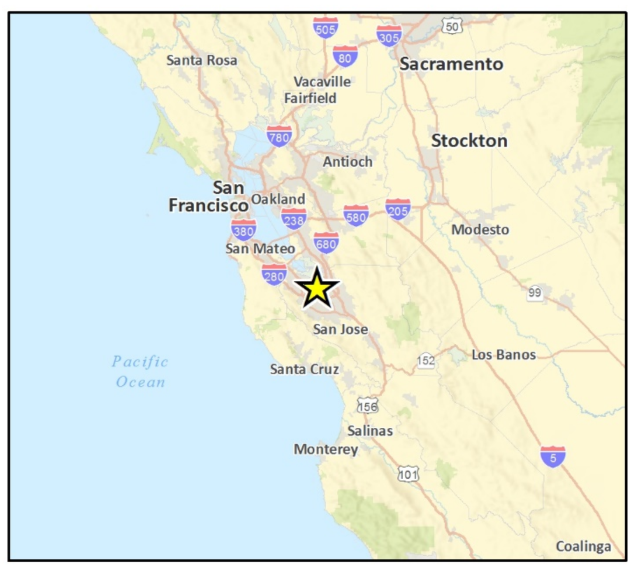

★ Project Location

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Fig 1 Regional Location

Figure 2 Project Site Location

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There are two curb cuts which allow vehicles to enter the site from Stender Way. Primary pedestrian access is also from Stender Way. The site includes utility connections (water, sewer, and electrical) and a Silicon Valley Power (SVP) utility easement that runs along the southern and western edge of the site. Additionally, there is an easement for electrical systems in favor of the City of Santa Clara encompassing the existing transformer and conduit.

Project Description

As part of the project, the existing single-story building would be demolished, and the associated parking lot would be removed. A four-story, 246,660 square-foot data center (SV9) would replace the existing uses on the site. The SV9 data center would be approximately 85 feet in height and would house computer servers and supporting equipment for private clients. Clients would either use the project as a place to relocate their existing servers or to store new servers and expand their server capacity. Sixteen standby, backup diesel generators (backup generators) would be added to the site to provide backup power to the SV9 data center in the event of a power failure.

At full buildout, the SV9 data center would have 48-megawatt (MW) connection to SVP service. The 48 MW service requirement for the SV9 data center would be met by the improvements made to SVP's nearby systems. A substation with capacity to fully serve the data center would be constructed.[1] For the purposes of this analysis, it is assumed that the SV9 data center would operate using 48-MW from opening day. This approach ensures that the maximum energy demand is captured.

Site improvements would include the SV9 data center building, a covered loading dock, exterior lighting, gated driveway access, parking lot, and perimeter landscaping (see Figure 3).

Building Design

The SV9 data center would be steel frame construction and would have an exterior aluminum composite panel system with materials chosen to match the texture and finish of adjacent CoreSite data centers. Backup generators for the SV9 data center would be housed at grade in weather enclosures, adjacent to both the SV9 build and new substation (see Figure 3).

Major Equipment

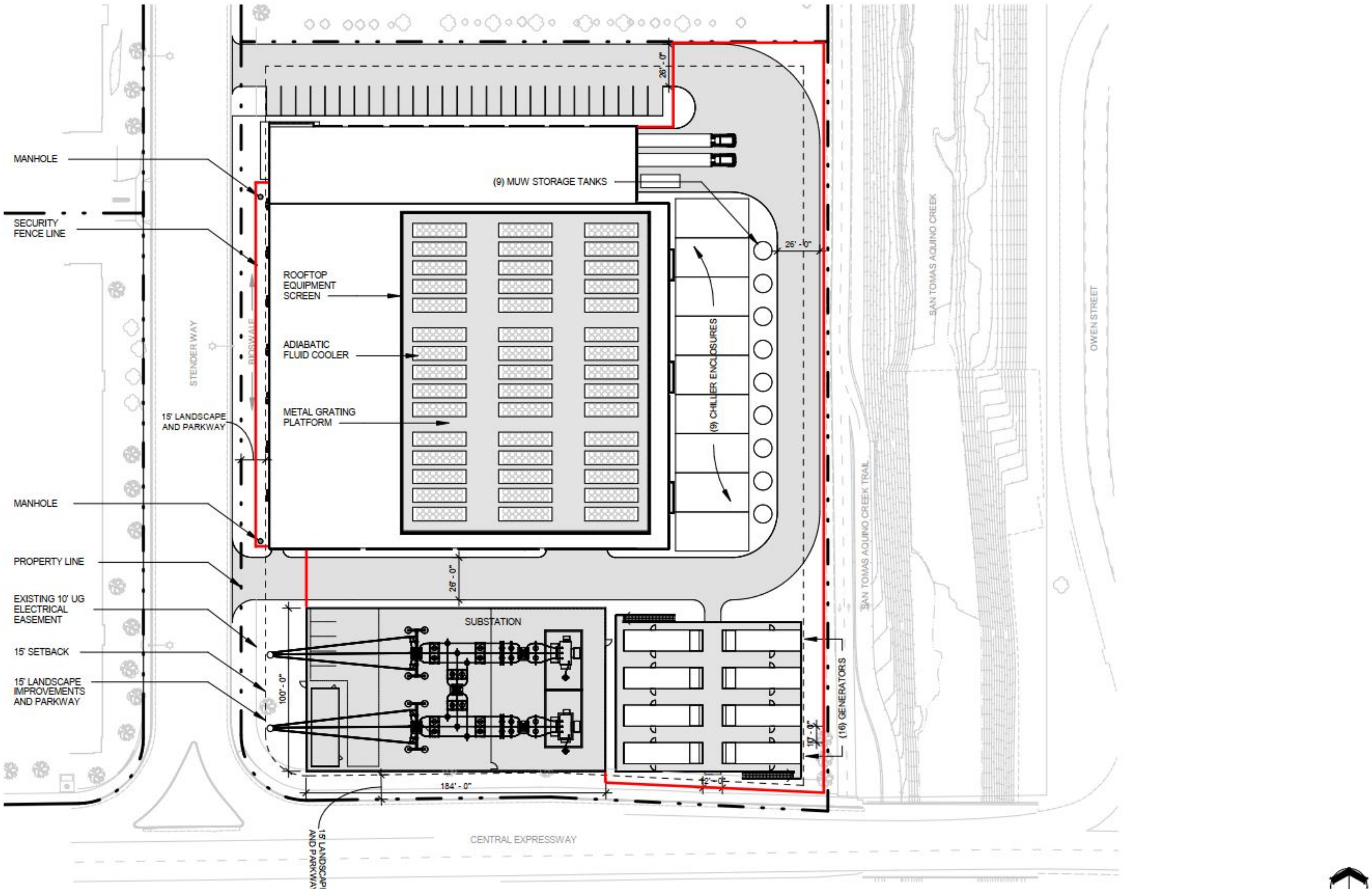
Table 1 provides a list of the major equipment that would be located on site as part of the project.

Table 1 Major Equipment

Equipment	Quantity	Location
3500-kilowatt (KW) backup generators	16 (N+2 configuration)	SV9 yard, adjacent to the data center
Modular Chiller Plant Enclosures	9 (N+1 configuration)	SV9 yard, adjacent to the data center
Adiabatic Fluid Coolers	45	Roof
Source: CoreSite, 2019		

[1] Precise information on required off-site improvements to SVP facilities to support the SV9 data center is not known at this time.

Figure 3 Proposed Site Plan



Source: Corgan 2019

Parking and Site Access

The project site currently has a total of 250 parking spaces, including eight accessible spaces consistent with Americans with Disabilities Act (ADA) requirements all of which would be removed as part of the project. Based on the anticipated parking demand for this project, a total of 99 spaces are required, 27 of which would be provided on site. The remaining 72 would be land banked. “Land banking” refers to land reserved for other uses (such as landscaping or outdoor seating) in lieu of parking spaces. The data center parking lot would be constructed along the northern side of the building.

Landscaping and Trees

The project would include landscaping consistent with the surrounding buildings to comply with the City’s design requirements. Construction of the SV9 data center and parking lot would require removal of 39 non-protected trees.

As shown in Figure 3, perimeter landscaping surrounding the existing building would be removed and partially replaced. New landscaping is proposed at the ends of the parking bays and replacement landscaping would be installed along the southern and western property boundary. An SVP duct bank currently exists along the south and west side of the property. Coordination with SVP would be necessary to meet SVP standards for access to duct banks. No additional landscaping is proposed.

Project Operation

Backup Energy Supply

A data center relies upon a constant supply of power to allow servers to operate continuously: 24 hours per day, seven days per week. To ensure continuous energy supply, the project would utilize sixteen 3.5-MW backup generators. The generators are designed to start up quickly in the event of a power failure. All generators would be installed in the equipment yard of the SV9 data center building.

Emissions from combustion engines for stationary uses, including diesel generators, are regulated by the U.S. Environmental Protection Agency (EPA). Engine emission standards have been categorized into a tiering system that designates maximum pollutant emissions. All new generators would have EPA Tier II engines and would be outfitted with diesel particulate filters. The generator engines would be fueled using ultra-low sulfur diesel fuel with a maximum sulfur content of 15 parts per million (ppm). All generator engines would be equipped with California Air Resources Board (CARB) Level 3 verified diesel particulate filters (DPFs) with a minimum control efficiency of 85 percent removal of particulate matter.

The generators would have maintenance testing performed throughout the year to ensure performance when needed during a power failure. All generators would be operated strictly in accordance with permitted hours as determined by the Bay Area Air Quality Management District (BAAQMD).

Generators would be installed in a double-stacked configuration. Each double-stack would be provided with a 13,000-gallon sub-base fuel storage tank. The top generator would have a 160-gallon diesel fuel tank installed next to the generator. The sub-base fuel storage tanks with be provisioned with fuel ports to allow refilling from the paved loop road surrounding the data center.

Additionally, the project would include uninterruptable power supplies (UPS) with direct-current (DC) batteries for backup power. Batteries would provide enough energy to cover the critical load of 35-MW in the event of a power failure. UPS and batteries would be located on each of the four floors, adjacent to the computer room the system serves.

Battery technology for commercial UPS systems is lead-acid type. The batteries are placed in cabinets and installed next to the associated UPS module in a temperature-controlled room for optimum efficiency and battery life. The quantity of batteries is dictated by the length of time the standby optional, backup generators need to start and reach full operating power. This is typically less than 1 minute; however, a safety factor is added which results in an average of five to six minutes of battery power available.

Cooling

Servers convert electrical energy into heat as they operate and need to be kept cool. Therefore, cooling systems are a critical component of data center operation. Cooling systems would be installed to remove heat, ensuring servers operate safely and effectively. The project would include nine modular chiller plants located in the chiller yard adjacent to the SV9 data center. Adiabatic fluid coolers would be installed on the roof of the data center. Each 1,575-ton chiller would be supported by five adiabatic fluid coolers, for a total of 45 adiabatic fluid chillers. The adiabatic fluid coolers require minimal make-up water and would collectively use approximately 18 acre-feet annually, or 5,865,325 gallons. It is anticipated that the make-up water serving the adiabatic fluid coolers would have a single potable source. To supplement, two 15,000-gallon aboveground water storage tanks would be installed on site to provide 24-hours of make-up water in the event of temporary loss of water service. Aboveground water tanks would be installed adjacent to the modular chiller plants.

The make-up water would be chemically treated on-site before use to meet specifications for water quality. Biocides and scale and corrosion inhibitors would be injected into the stream to limit biological growth. Water treatment chemicals would be stored in a pumphouse, located adjacent to the modular chiller plant to treat incoming potable water.

Employees

It is anticipated that up to eight employees would typically be working in the building during the daytime, and up to five employees per shift would work in the building in the evening and overnight for a total of up to 18 employees every 24 hours. As needed, technical support personnel would also be present on the site.

Vehicle Trips

Truck trips would occur during project operation to deliver and remove equipment as needed. Passenger vehicle trips to the site would be minimal, consisting of employees traveling to the site for work and occasional client visits.

Energy Usage

Major sources of energy demand for project operations would be client servers and the cooling system. The facility would use a maximum of 48-MW for a maximum load of 1,152,000 kilowatt-hours (kWh) daily. Worst-case annual energy consumption would be 420,480 megawatt hours (MWh). Peak critical IT load would be 35 MW. The facility would be designed to achieve an average of 5 kWh per rack, and a power usage effectiveness (PUE) rating of 1.35.

Overall, the daily power usage would vary depending on how many servers are running and how intensely the SV9 data center's clients are running their servers. The building would require very little lighting. Lighting would be used only to support small areas such as a security area, lobby, and office/conference room.

The project's electricity demand would be served by SVP.

Construction

Construction of the facility would commence in October 2020 and be completed in November 2021. Conventional construction equipment would be used, such as excavators, backhoes, and both light-duty trucks and heavy-duty dump trucks. Truck trips are expected to reach the project site via US-101, San Tomas Expressway, Scott Boulevard, and Central Expressway in addition to Coronado Drive and Stender Way. Truck trips for off-haul of excavated materials are expected to travel along these same routes and arterials to dispose of construction demolition debris.

2 Background

2.1 Overview of Energy

California is one of the lowest per capita energy users in the United States, ranked 48th in the nation, due to its energy efficiency programs and mild climate. California consumed 281,180 gigawatt-hours (GWh) of electricity and 12,638 million therms of natural gas in 2018 (California Energy Commission [CEC] 2019a). In addition, Californians consume approximately 18.9 billion gallons of motor vehicle fuels per year (Federal Highway Administration 2019). The single largest end-use sector for energy consumption in California is transportation (40 percent), followed by industry (24 percent), commercial (19 percent), and residential (18 percent) (United States Energy Information System [U.S. EIA] 2018a). Most of California's electricity is generated in-state with approximately 30 percent imported from the northwest and southwest in 2017. In addition, approximately 30 percent of California's electricity supply comes from renewable energy sources, such as wind, solar photovoltaic, geothermal, and biomass (CEC 2018a).

To reduce statewide vehicle emissions, California requires that all motorists use California Reformulated Gasoline, which is sourced almost exclusively from in-state refineries. Gasoline is the most used transportation fuel in California with 15.5 billion gallons sold in 2018 and is used by light-duty cars, pickup trucks, and sport utility vehicles (CEC 2019a). Diesel is the second most-used fuel in California with 1.8 billion gallons sold in 2018 and is used primarily by heavy duty-trucks, delivery vehicles, buses, trains, ships, boats and barges, farm equipment, and heavy-duty construction and military vehicles (CEC 2019a). Both gasoline and diesel are primarily petroleum-based, and their consumption releases greenhouse gas (GHG) emissions, including CO_2 and N_2O. The transportation sector is the single largest source of GHG emissions in California, accounting for 41 percent of all inventoried emissions in 2017 (California Air Resources Board [CARB] 2019).

Data centers are a highly energy-intensive land use that consumes approximately two percent of total electricity usage in the U.S. due to the substantial amount of energy required to power computer servers and operate the associated cooling/chilling equipment to prevent servers from overheating. On average, data centers consume approximately 10 to 50 times more energy per square foot than typical commercial office buildings (United States Department of Energy [U.S. DOE] 2019). As a result, energy efficiency is often a key concern in the design and operation of data centers.

2.2 Regional and Local Energy Setting

Energy use relates directly to environmental quality, because energy use can adversely affect air quality and can generate GHG emissions that contribute to climate change. Fossil fuels are burned to create electricity that powers residences, heats and cools buildings, and powers vehicles. Transportation energy use corresponds to the fuel efficiency of cars, trucks, and public transportation; the different travel modes such as single-passenger automobile, carpool, and public transit; and the miles traveled using these modes.

a. Energy Supply

Petroleum

California is one of the top producers of petroleum in the nation with drilling operations occurring throughout the state but concentrated primarily in Kern and Los Angeles counties. A network of crude oil pipelines connects production areas to oil refineries in the Los Angeles area, the San Francisco Bay area, and the Central Valley. California oil refineries also process Alaskan and foreign crude oil received at ports in Los Angeles, Long Beach, and the San Francisco Bay area. Crude oil production in California and Alaska is in decline, and California refineries depend increasingly on foreign imports (CEC 2018b). According to the U.S. EIA, California's field production of crude oil totaled 174.1 million barrels in 2017 (U.S. EIA 2018b).

City of Santa Clara Petroleum Infrastructure

In general, individual users, such as residents and employees, purchase petroleum fuels. There are over 20 gasoline stations but no petroleum refineries in Santa Clara (U.S. EIA 2018c, GasBuddy 2019). According to the California Department of Conservation (DOC) Division of Oil, Gas, and Geothermal Resources (DOGGR), there are no oil and gas wells in Santa Clara (DOGGR 2018a).

Alternative Fuels

A variety of alternative fuels are used to reduce petroleum-based fuel demand. Their use is encouraged through various statewide regulations and plans, such as the Low Carbon Fuel Standard and Senate Bill (SB) 32. Conventional gasoline and diesel may be replaced, depending on the capability of the vehicle, with alternative fuels such as hydrogen, biodiesel, and electricity. Currently, 35 hydrogen and 10 biodiesel refueling stations are located in California, but none are located in Santa Clara. Dozens of vehicle charging stations exist in Santa Clara (U.S. DOE n.d.).

Electricity

In 2018, California's overall electric generation including imported energy from throughout the northwestern and southwestern United States, totaled 285,488 GWh (CEC 2019b). Primary fuel sources for the state's power mix in 2018 included the following:

- Natural gas (34.9 percent)
- Large hydroelectric (10.7 percent)
- Solar (11.4 percent)
- Nuclear (9.1 percent)
- Wind (11.5 percent)
- Geothermal (4.5 percent)
- Small hydroelectric (1.6 percent)
- Biomass (2.4 percent)
- Coal (3.3 percent)
- Petroleum coke (<1 percent)
- Waste heat (<1 percent)
- Oil (<1 percent)
- Other Unspecified (10.5 percent)

According to the 2018 Integrated Energy Policy Report, California's electric grid relies increasingly on clean sources of energy such as solar, wind, geothermal, hydroelectricity, and biomass (CEC 2018c). As this transition advances, the grid is also expanding to serve new sectors including electric vehicles, rail, and space and water heating. California has installed more renewable energy than any other state in the United States with 22,250 MW of utility-scale systems operational (CEC 2018c).

Silicon Valley Power

SVP would supply electricity to the project site. SVP is a local utility provider owned and operated by the City of Santa Clara. SVP serves approximately 55,394 customers and maintains 7,076 miles of electric distribution lines (SVP 2018a). In 2017 (the most recent year for which data is available), SVP's power mix consisted of 38 percent renewable resources (wind, geothermal, biomass, solar, and small hydroelectric), 9 percent coal, 16 percent natural gas, 34 percent large hydroelectric, and 3 percent unspecified power that is not traceable to sources (SVP 2018b). However, as of January 1, 2018, all power provided by SVP customers is coal-free (SVP 2019).

SVP's 2018 Integrated Resource Plan (IRP) serves as an assessment of future electric energy needs of SVP customers through 2038 and details the preferred plan for supplying electricity in a "safe, reliable, cost-effective, and environmentally responsible manner" (SVP 2018c). SVP anticipates meeting a 2038 energy load demand of approximately 5,718 GWh, an increase of approximately 1,679 GWh over forecast 2019 demand. The preferred plan outlined in the 2018 IRP meets and exceeds the 2030 renewable energy target set forth by SB 100, which is discussed further in Section 2.3, *Regulatory Setting* (SVP 2018c).

City of Santa Clara Electric Power Infrastructure

There are four petroleum power plants and four natural gas power plants in Santa Clara (U.S. EIA 2018c). Additionally, Santa Clara is served by a number of electricity substations. Substations in the vicinity of the project site include the Northwestern Substation (approximately 0.25 mile west of the project site), the Santa Clara Substation (approximately 0.4 mile southwest of the project site), and the Central Substation (approximately 0.6 mile northwest of the project site).

b. Energy Demand

Petroleum

State

In 2017, transportation accounted for 40 percent of California's total energy demand, amounting to approximately 3,175 trillion British thermal units (Btu) in 2017 (U.S. EIA 2019a). California's transportation sector, including rail and aviation, consumed roughly 585 million barrels of petroleum fuels in 2017 (EIA 2019b). In 2017, petroleum-based fuels were used for approximately 98.4 percent of the state's total transportation activity (EIA 2019b). According to the CEC, California's 2018 fuel sales totaled 15.5 billion gallons of gasoline and 1.8 billion gallons of diesel (CEC 2019a).

Santa Clara County

Santa Clara County fuel sales are compared to statewide sales herein to provide regional and statewide context for fuel consumption. As shown in Table 2, Santa Clara County consumed an estimated 643 million gallons of gasoline and 48 million gallons of diesel fuel in 2018, which was approximately 4.2 percent of statewide gasoline consumption and approximately 2.7 percent of statewide diesel fuel consumption (CEC 2019a).

Table 2 2018 Annual Gasoline and Diesel Consumption

Fuel Type	Santa Clara County (gallons)	California (gallons)	Proportion of Statewide Consumption
Gasoline	643,000,000	15,471,000,000	4.2%
Diesel	48,000,000	1,777,000,000	2.7%

Source: CEC 2019a

Electricity

State

California consumed approximately 281,120 GWh in 2018. Residential electricity demand accounted for approximately 33 percent of California's electricity consumption in 2018, and non-residential demand account for approximately 67 percent (CEC 2019c).

Santa Clara County

Electricity consumption in Santa Clara County is compared to statewide consumption herein to provide regional and statewide context. As shown in Table 3, Santa Clara County consumed approximately 16,668 GWh in 2018 (CEC 2018), which was approximately 20 percent of the combined electricity consumption by Pacific Gas & Electric (PG&E) and SVP (the two major electricity providers in Santa Clara County) and approximately 5.9 percent of statewide electricity consumption (CEC 2019c).

Table 3 2018 Electricity Consumption

Energy Type	Santa Clara County (GWh)	PG&E and SVP (GWh)	California (GWh)	Proportion of PG&E and SVP Consumption	Proportion of Statewide Consumption
Electricity	16,668	83,389	281,120	20%	5.9%

Source: CEC 2019c

2.3 Regulatory Setting

Federal

Energy Independence and Security Act of 2007

The Energy Independence and Security Act, enacted by Congress in 2007, is designed to improve vehicle fuel economy and help reduce the United States' dependence on foreign oil. It expands the production of renewable fuels, reducing dependence on oil, and confronting climate change. Specifically, it does the following:

- Increases the supply of alternative fuel sources by setting a mandatory Renewable Fuel Standard, requiring fuel producers to use at least 36 billion gallons of biofuel in 2022, which represents a nearly five-fold increase over 2007 levels
- Reduces U.S. demand for oil by setting a national fuel economy standard of 35 miles per gallon (mpg) by 2020 – an increase in fuel economy standards of 40 percent relative to 2007 levels

The Energy Independence and Security Act of 2007 also set energy efficiency standards for lighting (specifically light bulbs) and appliances. Development would also be required to install photosensors and energy-efficient lighting fixtures consistent with the requirements of 42 USC Section 17001 et seq.

Energy Policy and Conservation Act

Enacted in 1975, the Energy Policy and Conservation Act established fuel economy standards for new light-duty vehicles sold in the United States. The law placed responsibility on the National Highway Traffic and Safety Administration (NHTSA), a part of the United States Department of Transportation (U.S. DOT), for establishing and regularly updating vehicle standards. The United States Environmental Protection Agency (U.S. EPA) administers the Corporate Average Fuel Economy (CAFE) program, which determines vehicle manufacturers' compliance with existing fuel economy standards.

Corporate Average Fuel Economy Standards

The Corporate Average Fuel Economy (CAFE) standards are federal rules established by the NHTSA that set fuel economy and GHG emissions standards for all new passenger cars and light trucks sold in the United States. The CAFE standards generally become more stringent with time, reaching an estimated 38.3 miles per gallon for the combined industry-wide fleet for model year 2020 (77 Federal Register 62624 et seq. [October 15, 2012 Table I-1). It is, however, legally infeasible for individual municipalities to adopt more stringent fuel efficiency standards. The CAA (42 United States Code [USC] Section 7543[a]) states that "no state or any political subdivision therefore shall adopt or attempt to enforce any standard relating to the control of emissions from new motor vehicles or new motor vehicle engines subject to this part." In August 2016, the U.S. EPA and NHTSA announced the adoption of the phase two programs related to the fuel economy and GHG standards for medium- and heavy-duty trucks. The phase two program will apply to vehicles with model year 2018 through 2027 for certain trailers, and model years 2021 through 2027 for semi-trucks, large pickup trucks, vans, and all types and sizes of buses and work trucks. The final standards are expected to lower CO_2 emissions by approximately 1.1 billion MT of CO_2 and reduce oil consumption by up to two billion barrels over the lifetime of the vehicles sold under the program (NHSTA 2019).

As of September 2018, NHSTA and U.S. EPA were undergoing the rulemaking process to establish the Safer Affordable Fuel Efficient (SAFE) Vehicles Rule for Model Years 2021-2026 Passenger Cars and Light Trucks (SAFE Vehicles Rule). The SAFE Vehicles Rule would amend the existing CAFE standards such that the requirements for model years 2021 through 2026 are lowered to the 2020 standards of 43.7 miles per gallon (mpg) and 204 grams of CO_2 per mile for passenger cars and 31.3 mpg and 284 grams of CO_2 per mile for light duty trucks (U.S. EPA 2018). In September 2019, the U.S. EPA and NHTSA published a final action, the SAFE Vehicles Rule Part One: One National Program, in the Federal Register. The action withdraws California's waiver for its GHG and zero-emission vehicles programs under the Clean Air Act and clarifies federal authority to preempt other state programs related to fuel economy standards. The joint action officially took effect November 26, 2019.

Construction Equipment Fuel Efficiency Standard

The U.S. EPA sets emission standards for construction equipment. The first federal standards (Tier 1) were adopted in 1994 for all off-road engines over 50 horsepower (hp) and were phased in by 2000. A new standard was adopted in 1998 that introduced Tier 1 for all equipment below 50 hp and established the Tier 2 and Tier 3 standards. The Tier 2 and Tier 3 standards were phased in by 2008 for all equipment. The current iteration of emissions standards for construction equipment are the Tier 4 efficiency requirements are contained in 40 Code of Federal Regulations Parts 1039, 1065, and 1068 (originally adopted in 69 Federal Register 38958 [June 29, 2004], and most recently updated in 2014 [79 Federal Register 46356]). Emissions requirements for new off-road Tier 4 vehicles were to be completely phased in by the end of 2015.

Energy Star Program

In 1992, the U.S. EPA introduced Energy Star as a voluntary labeling program designed to identify and promote energy-efficient products to reduce GHG emissions. The program applies to major household appliances, lighting, computers, and building components such as windows, doors, roofs, and heating and cooling systems. Under this program, appliances that meet specification for maximum energy use established under the program are certified to display the Energy Star label. In 1996, the U.S. EPA joined with the U.S. DOE to expand the program, which now also includes qualifying commercial and industrial buildings, as well as homes (Energy Star 2019).

State

California Energy Plan

The CEC is responsible for preparing the California Energy Plan, which identifies emerging trends related to energy supply, demand, conservation, public health and safety, and the maintenance of a healthy economy. The 2008 California Energy Plan calls for the state to assist in the transformation of the transportation system to improve air quality, reduce congestion, and increase the efficient use of fuel supplies with the least environmental and energy costs. To further this policy, the plan identifies several strategies, including assistance to public agencies and fleet operators in implementing incentive programs for zero-emission vehicles and addressing their infrastructure needs, as well as encouragement of urban designs that reduce vehicle miles traveled and accommodate pedestrian and bicycle access.

Reducing California's Petroleum Dependence (Assembly Bill 2076)

Pursuant to Assembly Bill (AB) 2076 (Chapter 936, Statutes of 2000), the CEC and CARB prepared and adopted a joint-agency report, *Reducing California's Petroleum Dependence,* in 2003. Included in this report are recommendations to increase the use of alternative fuels to 20 percent of on-road transportation fuel use by 2020 and 30 percent by 2030, significantly increase the efficiency of motor vehicles, and reduce per capita vehicle miles traveled. One of the performance-based goals of AB 2076 is to reduce petroleum demand to 15 percent below 2003 demand. Furthermore, in response to the CEC's 2003 and 2005 *Integrated Energy Policy Reports*, the Governor directed the CEC to take the lead in developing a long-term plan to increase alternative fuel use.

Integrated Energy Policy Report

Senate Bill 1389 (Chapter 568, Statutes of 2002) required the CEC to conduct assessments and forecasts of all aspects of energy industry supply, production, transportation, delivery and distribution, demand, and prices. The CEC uses these assessments and forecasts to develop energy policies that conserve resources, protect the environment, ensure energy reliability, enhance the state's economy, and protect public health and safety. The most recent assessment, the *2018 Integrated Energy Policy Report*, contains two volumes. Volume I highlights the implementation of California's innovative policies and the role they have played in establishing a clean energy economy. Volume II, adopted February 20, 2019, provides more detail on several key energy policies, including decarbonizing buildings, increasing energy efficiency savings, and integrating more renewable energy into the electricity system (CEC 2018c and 2019d).

California Renewable Portfolio Standard and Senate Bill 100

Established in 2002 under SB 1078, and accelerated by SB 107 (2006), SB X 1-2 (2011), and SB 100 (2018), California's Renewable Portfolio Standard (RPS) obligates investor-owned utilities, energy service providers, and community choice aggregators to procure 33 percent total retail sales of electricity from renewable energy sources by 2020, 60 percent by 2030, and 100 percent by 2045. SB 100 also states "that it is the policy of the state that eligible renewable energy resources and zero-carbon resources supply 100 percent of retail sales of electricity to California end-use customers and 100 percent of electricity procured to serve all state agencies by December 31, 2045." The California Public Utilities Commission and the CEC are jointly responsible for implementing the program.

Pavley Standards (Assembly Bill 1493)

AB 1493 (Chapter 200, Statutes of 2002), known as the Pavley bill, amended Health and Safety Code sections 42823 and 43018.5, thereby requiring CARB to develop and adopt regulations that achieve maximum feasible and cost-effective reduction of GHG emissions from passenger vehicles, light-duty trucks, and other vehicles used for noncommercial personal transportation in California.

Implementation of new regulations prescribed by AB 1493 required that the state apply for a waiver under the federal Clean Air Act. Although the U.S. EPA initially denied the waiver in 2008, the U.S. EPA approved a waiver in June 2009, and in September 2009, CARB approved amendments to its initially adopted regulations to apply the Pavley standards that reduce GHG emissions to new passenger vehicles in model years 2009 through 2016. According to CARB, implementation of the Pavley regulations is expected to reduce fuel consumption while also reducing GHG emissions.

Energy Action Plan

In the October 2005, the CEC and California Public Utilities Commission updated their energy policy vision by adding some important dimensions to the policy areas included in the original Energy Action Plan, such as the emerging importance of climate change, transportation-related energy issues. and research and development activities. The CEC adopted an update to the Energy Action Plan II in February 2008 that supplements the earlier energy action plans and examines the state's ongoing actions in the context of global climate change.

State Alternative Fuels Plan (Assembly Bill 1007)

AB 1007 (Chapter 371, Statutes of 2005) required the CEC to prepare a plan to increase the use of alternative fuels in California. The CEC prepared the State Alternative Fuels Plan in partnership with CARB and in consultation with other federal, state, and local agencies. The Alternative Fuels Plan presents strategies and actions California must take to increase the use of alternative non-petroleum fuels in a manner that minimizes costs to California and maximizes the economic benefits of in-state production. The Alternative Fuels Plan assessed various alternative fuels and developed fuel portfolios to meet California's goals to reduce petroleum consumption, increase alternative fuels use, reduce GHG emissions, and increase in-state production of biofuels without causing a significant degradation of public health and environmental quality.

Bioenergy Action Plan (Executive Order S-06-06)

Executive Order (EO) S-06-06 establishes targets for the use and production of biofuels and biopower and directs state agencies to work together to advance biomass programs in California while providing environmental protection and mitigation. The EO establishes the following targets to increase the production and use of bioenergy, including ethanol and biodiesel fuels made from renewable resources: produce a minimum of 20 percent of its biofuels in California by 2010, 40 percent by 2020, and 75 percent by 2050. EO S-06-06 also calls for the state to meet a target for use of biomass electricity. The 2011 Bioenergy Action Plan identifies those barriers and recommends actions to address them so that the state can meet its clean energy, waste reduction, and climate protection goals. The 2012 Bioenergy Action Plan updated the 2011 Plan and provided a more detailed action plan to achieve the following goals:

- Increase environmentally and economically sustainable energy production from organic waste
- Encourage development of diverse bioenergy technologies that increase local electricity generation, combined heat and power facilities, renewable natural gas, and renewable liquid fuels for transportation and fuel cell applications
- Create jobs and stimulate economic development, especially in rural regions of the state
- Reduce fire danger, improve air and water quality, and reduce waste

Title 24, California Code of Regulations

Updated every three years through a rigorous stakeholder process, Title 24 of the California Code of Regulations requires California homes and businesses to meet strong energy efficiency measures, thereby lowering their energy use. Title 24 contains numerous subparts, including Part 1 (Administrative Code), Part 2 (Building Code), Part 3 (Electrical Code), Part 4 (Mechanical Code), Part 5 (Plumbing Code), Part 6 (Energy Code), Part 8 (Historical Building Code), Part 9 (Fire Code), Part 10 (Existing Building Code), Part 11 (Green Building Standards Code), Part 12 (Referenced Standards Code).

PART 6 (BUILDING ENERGY EFFICIENCY STANDARDS)

Part 6 of Title 24 contains the 2016 Building Energy Efficiency Standards for new residential and non-residential buildings, which went into effect on January 1, 2017. Part 6 requires the design of building shells and building components to conserve energy. The standards are updated periodically to allow for consideration and possible incorporation of new energy efficiency technologies and methods. The 2016 Standards improve upon the previous 2013 Standards for new construction of and additions and alterations to residential and nonresidential buildings. Under the 2016 Standards, nonresidential buildings are generally five percent more energy efficient than the 2013 Standards as a result of better windows, insulation, lighting, ventilation systems, and other features (CEC 2015). Part 6 also provides for the installation of cool roofs in Sections 140.3(a)(1), 141.0(b)(2)(B), and 141.0(b)(3).

The 2019 Building Energy Efficiency Standards, adopted on May 9, 2018, will become effective on January 1, 2020. The 2019 Standards focus on four key areas: 1) smart residential photovoltaic systems; 2) updated thermal envelope standards (preventing heat transfer from the interior to exterior and vice versa); 3) residential and nonresidential ventilation requirements; 4) and nonresidential lighting requirements (CEC 2018d). Under the 2019 Standards, nonresidential buildings will be 30 percent more energy-efficient compared to the 2016 Standards (CEC 2018e).

PART 11 (CALGREEN)

On July 17, 2008, the California Building Standards Commission adopted the nation's first green building standards. The California Green Building Standards Code (24 CCR, Part 11, known as "CALGreen") was adopted as part of the California Building Standards Code. CALGreen established planning and design standards for sustainable site development, energy efficiency (in excess of the California Energy Code requirements), water conservation, material conservation, and internal air contaminants. The mandatory provisions of the CALGreen became effective January 1, 2011 and were updated in 2016. The 2016 Standards, which became effective on January 1, 2017, establish green building criteria for residential and nonresidential projects. The CEC adopted updates to the 2016 Standards in 2019 that will take effect on January 1, 2020.

Local

City of Santa Clara General Plan

The City of Santa Clara General Plan (2010) contains goals and policies that are designed to encourage reduced energy use. The following goals and policies that would apply to the project:

Goal 5.10.3-G1. Energy supply and distribution maximizes the use of renewable resources.

> **Policy 5.10.3-P1.** Promote the use of renewable energy resources, conservation and recycling programs.

Goal 5.10.3-G2. Implementation of energy conservation measures to reduce consumption.

> **Policy 5.10.3-P4.** Encourage new development to incorporate sustainable building design, site planning and construction, including encouraging solar opportunities.
>
> **Policy 5.10.3-P5.** Reduce energy consumption through sustainable construction practices, materials and recycling.
>
> **Policy 5.10.3-P6**. Promote sustainable buildings and land planning for all new development, including programs that reduce energy and water consumption in new development.

City of Santa Clara Climate Action Plan

The City of Santa Clara Climate Action Plan (2013) contains goals and policies that are designed to encourage reduced energy use. The following goals and policies that would apply to the project:

Focus Area 2: Energy Efficiency Programs

Goal: Maximize the efficient use of energy throughout the community.

2.3. Encourage new data centers with an average rack power rating of 15 kW or more to identify and implement cost-effective and energy-efficient practices.

City of Santa Clara Municipal Code

The City's energy code is codified in Chapter 15.36, *Adoption of the Energy Code,* of the Santa Clara Municipal Code (SCMC). Chapter 15.36 adopts the 2016 California Energy Code, published and copyrighted by the International Code Council, Inc., and the California Building Standards Commission in Part 6 of Title 24 of the California Code of Regulations.

3 Impact Analysis

3.1 Methodology

Energy consumption is analyzed herein in terms of construction and operational energy use. Construction energy demand accounts for anticipated energy consumption during project construction, such as fuel consumed by construction equipment and construction workers' vehicles traveling to and from the project site. Operational energy demand accounts for the anticipated energy consumption during project operation, such as electricity consumed for operation of computer servers, associated coolers/chillers, and building power needs as well as fuel consumed by employee and delivery vehicle trips to and from the project site and by maintenance and operation of backup generators.

Construction

Construction-related energy demand was estimated using the California Emissions Estimator Model (CalEEMod) version 2016.3.2 based on project data provided by the applicant, locally-appropriate industry-standard assumptions, and CalEEMod default values for projects in Santa Clara County when project specifics were not known. Modeling was completed as part of the Air Quality and Greenhouse Gas Study prepared for the project by Rincon in December 2019 (Rincon 2019). See Appendix B for energy calculation sheets.

Project construction would also use building materials that contain embodied energy (i.e., energy used during the manufacturing and/or procurement of that material); however, as Section 15126.2(b) of the *CEQA Guidelines* states, "This [energy] analysis is subject to the rule of reason and shall focus on energy use that is caused by the project." In addition, it is reasonable to assume that manufacturers of building materials such as concrete, steel, and lumber would employ energy conservation practices in the interest of minimizing the cost of doing business. It also is reasonable to assume that non-custom building materials, such as drywall and standard-shaped structural elements, would have been manufactured regardless of the proposed project and, if not used for the project, would be used in a different project. Therefore, energy consumption required for the manufacturing and/or procurement of each building and construction material is not considered within the scope of this analysis.

Operation

Operational energy demand was estimated primarily based on project data provided by the applicant, including the anticipated maximum load, equipment specifications, and number of employees. Energy demand for the treatment and transport of water and wastewater was calculated using the estimated water demand from the CalEEMod output files contained in the Air Quality and Greenhouse Gas Study (Rincon 2019).

Electricity used to treat and convey water and wastewater for the proposed project was calculated in accordance with the methodology used for the air pollutant and GHG emission modeling in CalEEMod (California Air Pollution Control Officers Association [CAPCOA] 2017). Table 4 shows the water and wastewater electricity intensity factors for Santa Clara County that were used to calculate electricity consumption from supplying, treating, and distributing water as well as from treating wastewater. The estimated amount of water consumed annually by the proposed project was multiplied by the water and wastewater electricity intensity factors to determine the total annual amount of electricity required for water and wastewater treatment and conveyance. It is conservatively assumed that all water consumed would be discharged to the wastewater treatment system.

Table 4 Water and Wastewater Electricity Intensity Factors for Santa Clara County

Process	Electricity Intensity Factor (kWh/million gallons)
Supply Water	2,117
Treat Water	111
Distribute Water	1,272
Treat Wastewater	1,911

kWh = kilowatt-hours

Source: CAPCOA 2017, Appendix D, Table 9.2

Fuel consumption by vehicle trips to and from the project site was estimated using the vehicle miles traveled and vehicle fleet mix provided in the CalEEMod output files contained in the Air Quality and Greenhouse Gas Study (Rincon 2019). See Appendix B for energy calculation sheets.

The project site is currently developed with an existing, approximately 54,000 square foot light industrial building and parking lot. Therefore, energy demand from electricity, water consumption and wastewater treatment, and vehicle trips associated with the existing land use on-site was also quantified using the methods described above in order to more accurately characterize proposed project's net increase in energy consumption.

3.2 Significance Thresholds

To determine whether a project would have a significant energy impact, Appendix G to the *CEQA Guidelines* requires consideration of whether a project would:

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

Wasteful, Inefficient, and Unnecessary Consumption of Energy

There are no formally adopted criteria signifying the relative efficiency of a project during its construction phase. Therefore, this analysis takes into consideration the equipment and processes employed during project construction to qualitatively determine whether energy consumed during construction would be wasteful, inefficient, or unnecessary.

The analysis of operational energy demand uses both quantitative and qualitative approaches to determine whether energy consumed during operation would be wasteful, inefficient, or unnecessary. The efficiency of the proposed data center operations is evaluated using the Power Usage Effectiveness (PUE) factor, which is a measure used by the data center industry to estimate the efficiency of data centers. The PUE is calculated by dividing the total demand of the data center by the critical IT load. The closer the PUE is to a value of 1, the more efficient data center operations are. Table 5 summarizes the range and relative efficiency level associated with different PUE factors. As shown therein, a PUE between 1.5 and 2.0 is considered "efficient" while a PUE between 1.2 to 1.5 is considered "very efficient." The PUE factor is used herein as an applicable criterion for determining whether operational energy consumption would be wasteful, inefficient, or unnecessary. If the project's PUE exceeds 2.0, energy consumption resulting from project operation would be considered wasteful, inefficient, and unnecessary.

Table 5 Power Usage Effectiveness Factors and Efficiency Levels

Power Usage Effectiveness Factor	Level of Efficiency
3.0	Very Inefficient
2.5	Inefficient
2.0	Average
1.5	Efficient
1.2	Very Efficient

Source: 42U 2019

Operational energy demand is also quantitatively evaluated based on a comparison of project design features and the 2019 Title 24 standards. Furthermore, the analysis qualitatively considers the potential for inefficient, wasteful, or unnecessary energy consumption by the treatment and conveyance of water and wastewater and vehicle trips associated with project operation.

Consistency with Renewable Energy and Energy Efficiency Plans

The project's consistency with state and local plans for renewable energy and energy efficiency is evaluated qualitatively. A project is considered consistent with the provisions of these documents if it meets the general intent in advancing energy efficiency and increasing renewable energy in order to facilitate the achievement of City- and state-adopted goals and does not impede attainment of those goals. A given project need not be in perfect conformity with each and every planning policy or goals to be consistent. A project would be consistent if it would further the objectives and not obstruct their attainment. The following plans for renewable energy and energy efficiency would be applicable to the proposed project:

- Senate Bill (SB) 100, which mandates 100 percent renewable energy for California by 2045.
- Title 24 California Code of Regulations, which contains the state's Building Energy Efficiency Standards and CALGreen requirements.
- Santa Clara General Plan, which includes goals and policies relevant to maximizing the use of renewable resources and implementing energy conservation measures.
- Santa Clara Climate Action Plan, which includes a goal and policy related to maximizing energy efficiency specifically with regard to the operation of new data centers.

3.3 Impact Analysis

Threshold 1:	Would the proposed project result in a potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?

Construction

Project construction would require energy resources primarily in the form of fuel consumption to operate heavy equipment, light-duty vehicles, machinery, and generators. Temporary power may also be provided for construction trailers and electric construction equipment. Table 6 summarizes the anticipated energy consumption from construction equipment and vehicles, including construction worker trips to and from the project site.

Table 6 Proposed Project Construction Energy Usage

	Fuel Consumption (Gallons)	
Source	**Gasoline**	**Diesel**
Construction Equipment & Hauling Trips	–	43,547
Construction Worker Vehicle Trips	13,904	–

See Appendix B for energy calculation sheets. Construction schedule and equipment parameters were based on CalEEMod output files provided in the Air Quality and Greenhouse Gas Study (Rincon 2019).

As shown in Table 6, project construction would require approximately 13,904 gallons of gasoline and 43,547 gallons of diesel fuel. Energy use during construction would be temporary in nature, and construction equipment used would be typical of similar-sized construction projects in the region. In addition, construction contractors would be required to comply with the provisions of California Code of Regulations Title 13 Sections 2449 and 2485, which prohibit diesel-fueled commercial motor vehicles and off-road diesel vehicles from idling for more than five minutes and would minimize unnecessary fuel consumption. Construction equipment would be subject to the U.S. EPA Construction Equipment Fuel Efficiency Standard (i.e. Tier 4 efficiency requirements, discussed in detail in Section 2.3, *Regulatory Setting*), which would also minimize inefficient, wasteful, or unnecessary fuel consumption.

Electrical power would be consumed to construct the project, and the demand, to the extent required, would be supplied from existing electrical infrastructure in the area. However, construction activities would require minimal electricity consumption and would not be expected to have any adverse impact on available electricity supplies or infrastructure. In addition, per applicable regulatory requirements such as 2019 CALGreen, the project would comply with construction waste management practices to divert a minimum of 65 percent of construction and demolition debris. These practices would result in efficient use of energy necessary to construct the project. Furthermore, in the interest of cost-efficiency, construction contractors would not utilize fuel in a manner that is wasteful or unnecessary, such as scheduling unnecessary deliveries of materials or operating diesel-fueled equipment while not in use. Therefore, project construction would not result in potentially significant environmental effects due to the wasteful, inefficient, or unnecessary consumption of energy, and construction impacts would be less than significant.

Operation

Energy demand from project operation would include electricity consumed by computer servers, coolers/chillers, and building operations as well as gasoline fuel consumed by employee vehicle trips and diesel fuel intermittently consumed by backup generators and diesel delivery tank trucks. Energy consumption is analyzed by fuel type in the following subsections.

Electricity Consumption

As described in Section 1.2, *Project Description*, the proposed project would have a maximum load of 48 MW. Assuming continuous operation of the project for 24 hours per day for 365 days per year, the project would consume up to approximately 420,480 MWh of electricity annually.[2] This estimate of electricity usage includes electricity to power the computer servers; air cooled chillers; the cooling tower; exhaust ventilators; air handling units; other associated heating, ventilation, and air conditioning equipment; exterior and interior lighting; and indoor appliances. According to the CalEEMod outputs for the existing site conditions included in the Air Quality and Greenhouse Gas Study (Rincon 2019), the existing light industrial building and parking lot consume approximately 474,040 kWh of electricity per year, or approximately 474 MWh of electricity per year. Consequently, the project would result in a net increase in electricity demand of approximately 420,006 MWh annually.

Electricity would be provided by SVP, which would serve the project through a proposed 48MVA69kV-12.0kV substation on-site as well as upgrades to other off-site electrical infrastructure. SVP has a renewable energy procurement portfolio of 38 percent, which would reduce the amount of nonrenewable fuels consumed to supply electricity to the project site (SVP 2018b). At peak operating capacity, the PUE for the proposed project would be 1.37;[3] however, the average annualized PUE for the proposed project would be expected to be lower and the project has a targeted PUE of 1.35.[4] As discussed in Section 3.2, *Significance Thresholds*, a PUE between 1.2 and 1.5 is considered “very efficient.” Therefore, under both peak and average conditions, the project would operate at a “very efficient” level. As such, project operations would not result in the wasteful, inefficient, or unnecessary consumption of electricity. The proposed project would be subject to the latest iteration of the Title 24 standards, which are designed to conserve energy use and maximum energy efficiency. Therefore, building design and construction would further minimize the potential for the wasteful, inefficient, or unnecessary consumption of energy during project operation. Operation-related energy impacts from electricity consumption of the data servers and building itself would be less than significant.

Day-to-day project operation would consume electricity to treat and transport water and wastewater to and from the project site. The primary source of water consumption associated with the project are cooler/chiller systems used to keep servers and other electrical equipment at the data center cool. According to the CalEEMod output files and project-specific water consumption detailed in the Air Quality and Greenhouse Gas Study (Rincon 2019), the project would require approximately 5.9 million gallons of water per year, which would consume approximately 32 MWh per year for treatment and transport to and from the project site (see Table 7 for electricity calculations). The proposed project would incorporate higher-efficiency plumbing fixtures in

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[2] Calculation: 48 MW times 24 hours per day times 365 days per year = 420,480 MWh

[3] Peak demand of 48 MW divided by peak critical IT load of 35 MW

[4] Based on e-mail correspondence between project applicant and Circlepoint dated May 3, 2019.

accordance with the latest Title 24 requirements, which would reduce the potential the inefficient or wasteful consumption of energy related to water and wastewater. Furthermore, cooling equipment would include air cooled chillers that only require a one-time fill of water for operation, which would further reduce wasteful and unnecessary water consumption as compared to traditional evaporative cooling systems. Finally, while cooler/chiller systems would consume water, estimated project water consumption would be less than that of the current light industrial building, likely due to a reduction in total employees, use of bathroom or cooking facilities, and other water-intensive light industrial uses. As shown in Table 7, the project would result in a net decrease in electricity consumption associated with water use at the project site.

Table 7 Electricity Consumption related to Water and Wastewater Treatment and Conveyance

Process	Annual Electricity Consumption (MWh)[1]
Supply Water	12.49
Treat Water	0.65
Distribute Water	7.50
Wastewater Treatment	11.27
Total	*31.92*
Electricity Consumption Associated with Existing Light Industrial Building Water Use	67.57
Total Net Electricity Consumption Associated with Water Use	***(35.65)***

MWh = megawatt-hours

() denote negative value.

Total may not sum precisely due to rounding.

[1] Annual electricity consumption was calculated by multiplying the project's estimated water demand by the electricity intensity factors shown in Table 4.

Gasoline and Diesel Fuel Consumption

BACKUP GENERATORS

The project would include 16 3.5-MW diesel-fired backup generators, at least two of which would be redundant. In the event of a power outage, the project would rely on these backup generators to provide electricity. Testing and maintenance of the generators would occur no more than 50 hours annually, per the BAAQMD's Authority to Construct. Assuming that approximately 241 gallons of diesel fuel are required per hour to test generators at full load, backup generator testing would require approximately 12,050 gallons of diesel fuel per generator annually for a total of approximately 192,800 gallons annually (Cummins, Inc. 2018, Appendix C).[5, 6] Although up to 50 hours of testing and maintenance is assumed based on compliance with BAAQMD's Authority to Construct, this provides a conservative analysis as annual maintenance and testing is anticipated to only be approximately 16 hours per generator per year. Furthermore, generators would not be expected to operate at full load for all maintenance and testing activities. Maintenance and

[5] Calculation: 241 gallons per hour * 50 hours = 12,050 gallons

[6] Calculation: 12,050 gallons * 16 generators = 192,800 gallons

emergency use of the backup generators would not result in the wasteful, inefficient, or unnecessary consumption of energy because routine maintenance would be conducted periodically based on the minimum requirements to ensure reliability and operation would only occur during infrequent extended power outage events.

VEHICLE TRIPS

Project operation would result in the consumption of gasoline and diesel fuels by employee vehicle trips and diesel delivery trucks. The project would employ approximately 18 full-time employees per day (8 during the day and 5 per shift during the evening and overnight shifts) who would travel to and from the project site on a daily basis. In addition, project operation would also require periodic trips by service technicians and suppliers. Based on anticipated vehicle miles traveled and the anticipated fleet mix in the CalEEMod output, operational vehicle trips would consume approximately 1,608 gallons of gasoline per year and approximately 355 gallons of diesel fuel annually (see Appendix B for energy calculation sheets). This analysis does not account for factors which would facilitate use of active or public transportation. For example, the project site is located immediately adjacent to the San Tomas Aquino Creek Trail and, via the trail, within 0.5 mile of bus stops located along Scott Boulevard to the north which are served by Valley Transportation Authority Routes 58, 304, and 827. Furthermore, because use of the backup generators would be limited to routine maintenance and extended power outages, deliveries to re-supply diesel fuel stored on-site would be infrequent and only on an as-needed basis. Finally, according to the CalEEMod outputs provided in the Air Quality and Greenhouse Gas Study (Rincon 2019), the existing light industrial building on the project site generates substantially greater vehicle miles traveled and consumes approximately 36,527 gallons of gasoline and 8,072 gallons of diesel fuel annually. Consequently, the project would be expected to result in a net decrease in operational fuel consumption associated with vehicle trips. Therefore, fuel consumption by employee and delivery vehicle trips would not be wasteful, inefficient, or unnecessary.

Overall Operational Energy Usage

As discussed in the preceding subsections, project operation would consume electricity as well as gasoline and diesel fuels. However, because of project design features that would maximize energy efficiency and conservation, overall project operation would not result in the wasteful, inefficient, or unnecessary consumption of energy resources. Therefore, operational energy impacts would be less than significant.

Threshold 2:	Would the proposed project conflict with or obstruct a state or local plan for renewable energy or energy efficiency?

State Plans

As mentioned above, SB 100 mandates 100 percent clean electricity for California by 2045. Because the proposed project would be powered by the existing electricity grid, the project would eventually be powered by renewable energy mandated by SB 100 and would not conflict with this statewide plan. Furthermore, the project would comply with all applicable Title 24 requirements pertaining to energy efficiency and renewable energy. As such, the project would not conflict with or obstruct implementation of state plans for renewable energy or energy efficiency.

Local Plans

As discussed in Section 2.3, *Regulatory Setting*, the City's General Plan and Climate Action Plan include several goals and policies related to renewable energy and energy efficiency. The project's consistency with these goals and policies is evaluated in Table 8. As shown therein, the proposed project would be consistent with renewable energy and energy efficiency plans. Therefore, potential impacts associated with renewable energy and energy efficiency would be less than significant.

Table 8 Project Consistency with Plans for Renewable Energy and Energy Efficiency

Energy Efficiency Goal or Policy	Project Consistency
Santa Clara General Plan	
Goal 5.10.3-G1. Energy supply and distribution maximizes the use of renewable resources. ▪ **Policy 5.10.3-P1.** Promote the use of renewable energy resources, conservation and recycling programs.	**Consistent.** The proposed project would source its electricity from SVP, which has a renewable energy procurement portfolio of 38 percent renewable resources. SVP would be subject to the provisions of SB 100, which requires utility providers to increase their renewable energy procurement portfolios to 60 percent by 2030 and 100 percent by 2045. Therefore, the project would be consistent with Goal 5.10.3-G1.
Goal 5.10.3-G2. Implementation of energy conservation measures to reduce consumption. ▪ **Policy 5.10.3-P4.** Encourage new development to incorporate sustainable building design, site planning and construction, including encouraging solar opportunities. ▪ **Policy 5.10.3-P5.** Reduce energy consumption through sustainable construction practices, materials and recycling. ▪ **Policy 5.10.3-P6.** Promote sustainable buildings and land planning for all new development, including programs that reduce energy and water consumption in new development.	**Consistent.** The proposed building would be required to meet 2019 Title 24 standards, thereby increasing the energy conservation achieved by building design. Under the 2019 Building Energy Efficiency Standards, nonresidential buildings will be 30 percent more energy-efficient compared to those constructed under the 2016 Standards. The project would also be required to comply with the requirements of 2019 CALGreen, which mandate a minimum diversion rate of 65 percent for construction and demolition waste. As discussed under Threshold 1, the project would be anticipated to result in a net decrease in water and transportation-related gasoline/diesel fuel consumption relative to existing conditions. Therefore, the project would be consistent with Goal 5.10.3-G3, Policy 5.10.3-P4, Policy 5.10.3-P5, and Policy 5.10.3-P6.
Santa Clara Climate Action Plan	
Focus Area 2: Energy Efficiency Programs **Goal**: Maximize the efficient use of energy throughout the community. ▪ **2.3.** Encourage new data centers with an average rack power rating of 15 kW or more to identify and implement cost-effective and energy-efficient practices.	**Consistent**. Based on data provided by the project applicant and similar data center designs, the project would have an average rack power rating of 5 to 6.5 kW. As discussed under Threshold 1, the project would have a targeted PUE of 1.35, which falls into the "very efficient" range (42U 2019). Therefore, the project would be consistent with Policy 2.3.
Sources: City of Santa Clara 2010 and 2013	

4 Conclusions and Recommendations

As discussed in Section 3.3, *Impact Analysis,* the proposed project would not result in the wasteful, inefficient, or unnecessary consumption of energy resources. Furthermore, the project would not conflict with plans for renewable energy and energy efficiency. Therefore, for the purposes of CEQA, the project's energy impacts would be less than significant, and no mitigation measures would be required.

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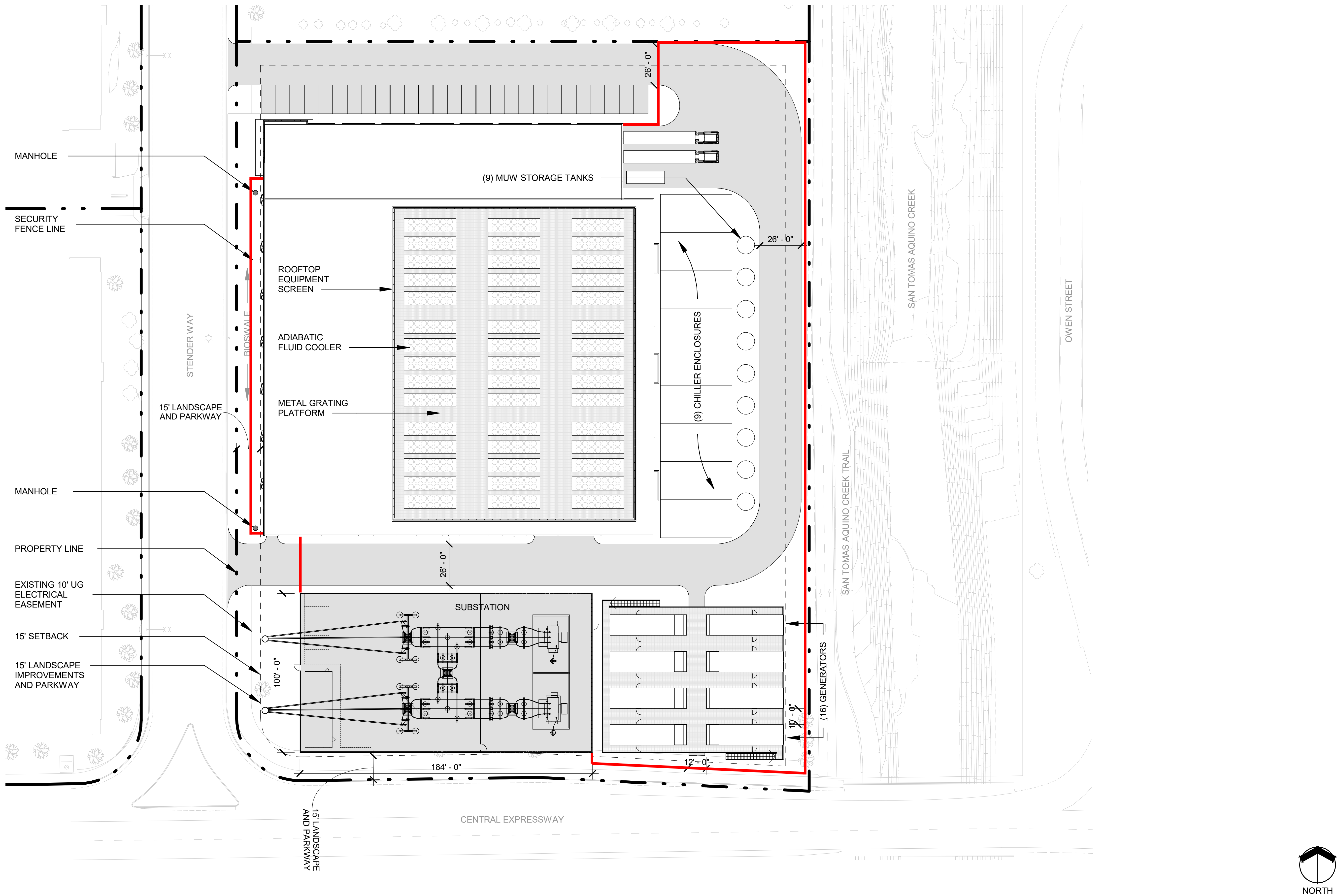
Appendix A

Project Site Plan



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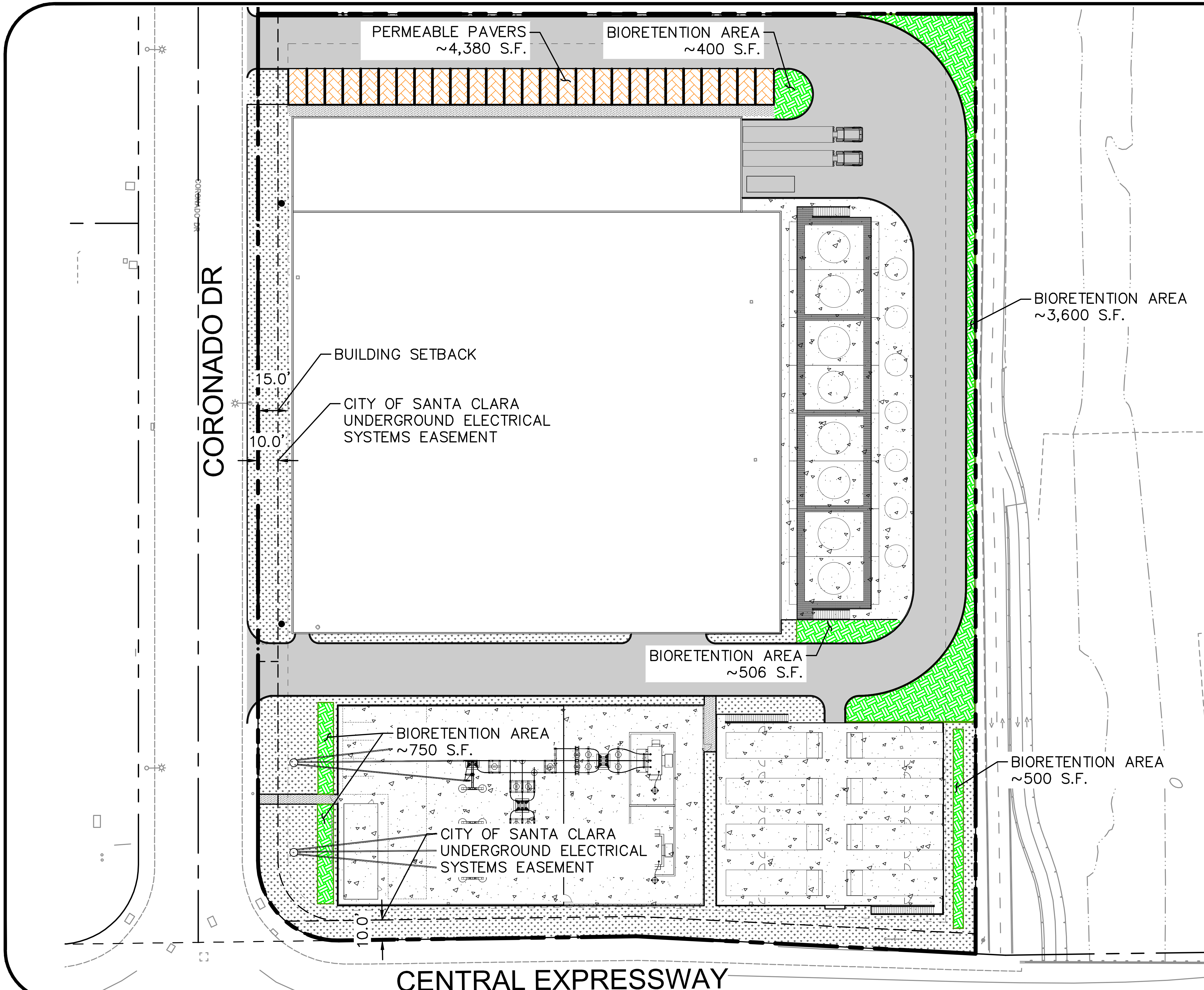
CORESITE SV9 DATA CENTER - PCC SUBMISSION

SITE PLAN

09.04.2019



LEGEND

- SIDEWALK CONCRETE
- HEAVY-DUTY CONCRETE
- ASPHALT
- LANDSCAPE
- PERVIOUS PAVERS
- BIORETENTION AREA

AREAS (SQUARE FEET)

TOTAL AREA:	167,288
PERVIOUS:	24,960
PERVIOUS PAVERS:	4,380
IMPERVIOUS:	137,930
* EFFECTIVE IMPERVIOUS AREA:	140,425
4% TREATMENT REQUIRED:	5,520
TREATMENT PROVIDED:	5,765

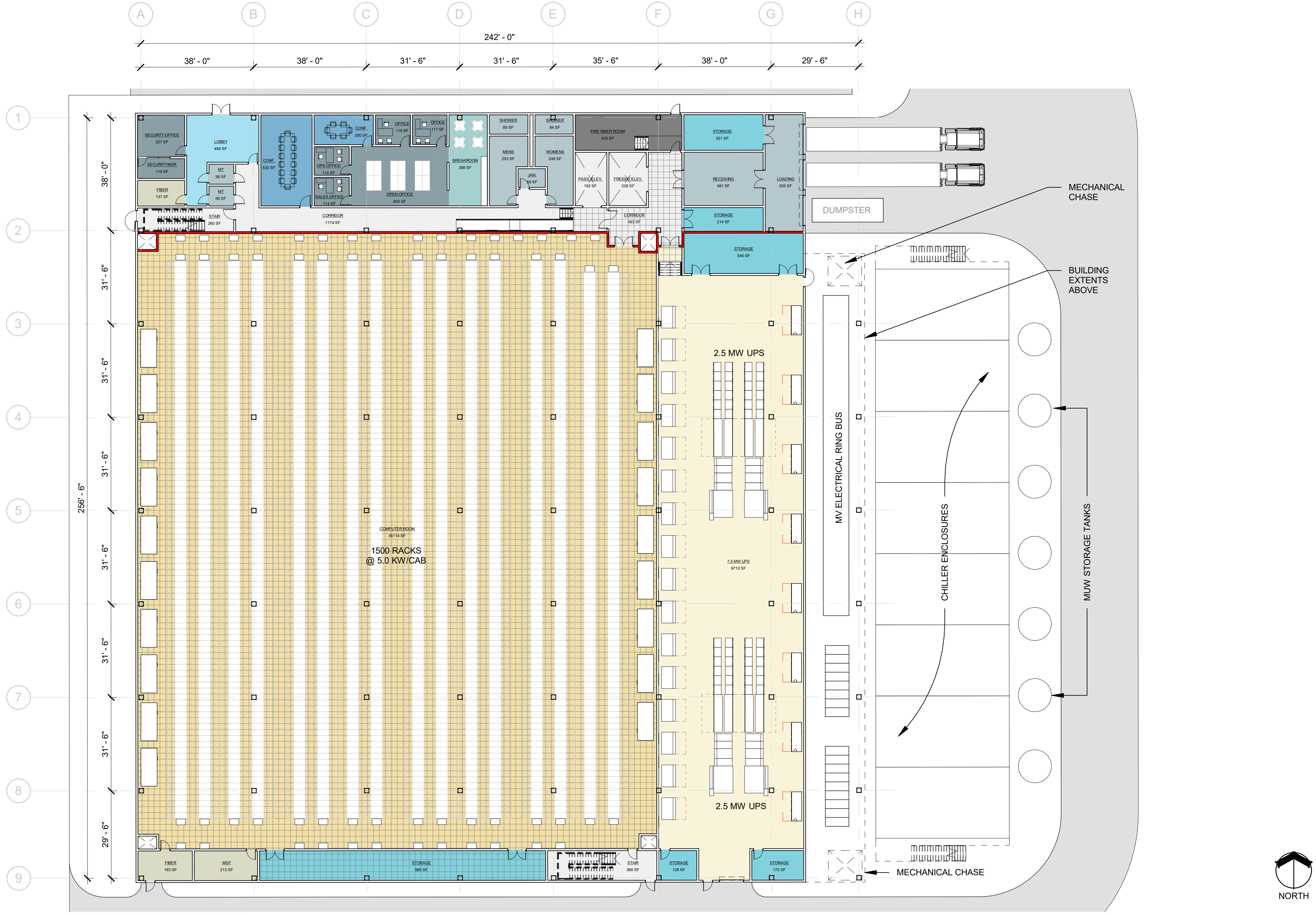
* EFFECTIVE IMPERVIOUS AREA = 140,425
IMPERVIOUS AREA + 10% PERVIOUS AREA

NORTH

GRAPHIC SCALE IN FEET
0 25 50 100

06/27/2019

Kimley»Horn



CORESITE SV9 DATA CENTER - CONCEPT REVIEW A

FLOOR PLAN - LEVEL ONE

06.24.2019

Appendix B

Energy Calculation Sheets

CoreSite - Santa Clara Data Center SV9

Last Updated: November 26, 2019

Compression-Ignition Engine Brake-Specific Fuel Consumption (BSFC) Factors **[1]**:

HP: 0 to 100	0.0588	HP: Greater than 100	0.0529

Values above are expressed in gallons per horsepower-hour/BSFC.

CONSTRUCTION EQUIPMENT

Construction Equipment	#	Hours per Day	Horsepower	Load Factor	Construction Phase	Fuel Used (gallons)
Concrete/Industrial Saws	1	8	81	0.73	Demo	555.96
Tractors/Loaders/Backhoes	3	8	97	0.37	Demo	1,012.34
Rubber Tired Dozer	1	8	247	0.40	Demo	835.59
Rubber Tired Dozer	1	7	247	0.40	Site Prep	73.11
Tractors/Loaders/Backhoes	1	8	97	0.37	Site Prep	33.74
Graders	1	8	187	0.41	Site Prep	64.84
Graders	1	6	187	0.41	Grading	97.26
Rubber Tired Dozer	1	6	247	0.40	Grading	125.34
Tractors/Loaders/Backhoes	1	7	97	0.37	Grading	59.05
Cranes	1	6	231	0.29	Building	5,948.92
Forklifts	1	6	89	0.20	Building	1,757.29
Generator Sets	1	8	84	0.74	Building	8,182.24
Tractors/Loaders/Backhoes	1	6	97	0.37	Building	3,543.20
Welders	3	8	46	0.45	Building	8,174.34
Air Compressors	1	6	78	0.48	Arch Coating	132.01
Pavers	1	6	130	0.42	Paving	173.17
Cement and Mortar Mixers	1	6	9	0.56	Paving	17.77
Tractors/Loaders/Backhoes	1	8	97	0.37	Paving	168.72
Paving Equipment	1	8	132	0.36	Paving	200.95
Rollers	1	7	80	0.38	Paving	125.05
					Total Fuel Used	**31,280.90 (Gallons)**

Construction Phase	Days of Operation
Demolition Phase	20
Site Preparation Phase	2
Grading Phase	4
Building Construction Phase	280
Paving Phase	10
Architectural Coating Phase	10
Total Days	326

WORKER TRIPS

Constuction Phase	MPG [2]	Trips	Trip Length (miles)	Fuel Used (gallons)
Demolition	24.0	13	10.8	117.00
Site Prep Phase	24.0	8	10.8	7.20
Grading Phase	24.0	8	10.8	14.40
Building Phase	24.0	108	10.8	13608.00
Paving Phase	24.0	13	10.8	58.50
Architectural Coating Phase	24.0	22	10.8	99.00
			Total	**13,904.10**

HAULING AND VENDOR TRIPS

Trip Class	MPG [2]	Trips	Trip Length (miles)	Fuel Used (gallons)
HAULING TRIPS				
Demolition	7.4	246	20.0	664.86
Site Prep Phase	7.4	0	20.0	0.00
Grading Phase	7.4	0	20.0	0.00
Building Phase	7.4	0	20.0	0.00
Paving Phase	7.4	0	20.0	0.00
Architectural Coating Phase	7.4	0	20.0	0.00
			Total	**664.86**
VENDOR TRIPS				
Demolition	7.4	0	7.3	0.00
Site Prep Phase	7.4	0	7.3	0.00
Grading Phase	7.4	0	7.3	0.00
Building Phase	7.4	42	7.3	11601.08
Paving Phase	7.4	0	7.3	0.00
Architectural Coating Phase	7.4	0	7.3	0.00
			Total	**11,601.08**

Total Gasoline Consumption (gallons)	**13,904.10**
Total Diesel Consumption (gallons)	**43,546.85**

Sources:

[1] United States Environmental Protection Agency. 2018. *Exhaust and Crankcase Emission Factors for Nonroad Compression-Ignition Engines in MOVES2014b* . July 2018. Available at: https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100UXEN.pdf.

[2] United States Department of Transportation, Bureau of Transportation Statistics. 2018. *National Transportation Statistics 2018* . Available at: https://www.bts.gov/sites/bts.dot.gov/files/docs/browse-statistical-products-and-data/national-transportation-statistics/223001/ntsentire2018q4.pdf.

CoreSite - Santa Clara Data Center SV9

Last Updated: November 26, 2019

Populate one of the following tables (Leave the other blank):

Annual VMT	
Annual VMT:	36,537

OR

Daily Vehicle Trips	
Daily Vehicle Trips:	
Average Trip Distance:	

Fleet Class	Fleet Mix
Light Duty Auto (LDA)	0.576985
Light Duty Truck 1 (LDT1)	0.039376
Light Duty Truck 2 (LDT2)	0.193723
Medium Duty Vehicle (MDV)	0.112069
Light Heavy Duty 1 (LHD1)	0.016317
Light Heavy Duty 2 (LHD2)	0.005358
Medium Heavy Duty (MHD)	0.017943
Heavy Heavy Duty (HHD)	0.025814
Other Bus (OBUS)	0.002614
Urban Bus (UBUS)	0.002274
School Bus (SBUS)	0.000887
Motorhome (MH)	0.000768
Motorcycle (MCY)	0.005874

Fuel Economy (MPG)	
Passenger Vehicles	24.0
Light-Med Duty Trucks	17.4
Heavy Trucks/Other	7.4
Motorcycles	43.9

Fleet Mix

Vehicle Type	Percent	Fuel Type	Annual VMT: VMT	Vehicle Trips: VMT	Fuel Consumption (Gallons)
Passenger Vehicles	*57.70%*	*Gasoline*	21081	0.00	878.39
Light-Medium Duty Trucks	*34.52%*	*Gasoline*	12611	0.00	724.79
Heavy Trucks/Other	*7.20%*	*Diesel*	2630	0.00	355.37
Motorcycle	*0.59%*	*Gasoline*	215	0.00	4.89

Total Gasoline Consumption (gallons)	**1608.07**
Total Diesel Consumption (gallons)	**355.37**

CoreSite - Santa Clara Data Center SV9

Last Updated: November 26, 2019

Populate one of the following tables (Leave the other blank):

Annual VMT		OR	Daily Vehicle Trips	
Annual VMT:	829,934		Daily Vehicle Trips:	
			Average Trip Distance:	

Fleet Class	Fleet Mix
Light Duty Auto (LDA)	0.576985
Light Duty Truck 1 (LDT1)	0.039376
Light Duty Truck 2 (LDT2)	0.193723
Medium Duty Vehicle (MDV)	0.112069
Light Heavy Duty 1 (LHD1)	0.016317
Light Heavy Duty 2 (LHD2)	0.005358
Medium Heavy Duty (MHD)	0.017943
Heavy Heavy Duty (HHD)	0.025814
Other Bus (OBUS)	0.002614
Urban Bus (UBUS)	0.002274
School Bus (SBUS)	0.000887
Motorhome (MH)	0.000768
Motorcycle (MCY)	0.005874

Fuel Economy (MPG)	
Passenger Vehicles	24.0
Light-Med Duty Trucks	17.4
Heavy Trucks/Other	7.4
Motorcycles	43.9

Fleet Mix

Vehicle Type	Percent	Fuel Type	Annual VMT: VMT	Vehicle Trips: VMT	Fuel Consumption (Gallons)
Passenger Vehicles	*57.70%*	*Gasoline*	478859	0.00	19952.48
Light-Medium Duty Trucks	*34.52%*	*Gasoline*	286467	0.00	16463.60
Heavy Trucks/Other	*7.20%*	*Diesel*	59734	0.00	8072.23
Motorcycle	*0.59%*	*Gasoline*	4875	0.00	111.05

Total Gasoline Consumption (gallons)	**36527.13**
Total Diesel Consumption (gallons)	**8072.23**

Appendix C

Generator Exhaust Emission Data Sheet

Exhaust emission data sheet
C3500 D6e
60 Hz Diesel generator set
EPA Tier 2

Engine Information:

Model:	Cummins Inc. QSK95-G9	Bore:	7.48 in. (190 mm)
Type:	4 Cycle, VEE, 16 cylinder diesel	Stroke:	8.27 in. (210 mm)
Aspiration:	Turbocharged and Aftercooled	Displacement:	5816 cu. in. (95.3 liters)
Compression Ratio:	15.5:1		
Emission Control Device:	Turbocharged and Aftercooled		
Emission Level:	Stationary Emergency		

Performance Data	**1/4 Standby**	**1/2 Standby**	**3/4 Standby**	**Full Standby**	**Full Prime**	**Full Continuous**
BHP @ 1800 RPM (60 Hz)	1362	2576	3789	5051	4309	3963
Fuel Consumption L/Hr (US Gal/Hr)	295 (78)	507 (134)	696 (184)	912 (241)	787 (208)	727 (192)
Exhaust Gas Flow m³/min (CFM)	320 (11298)	500 (17645)	609 (21518)	727 (25665)	662 (23372)	627 (22159)
Exhaust Gas Temperature °C (°F)	343 (650)	359 (678)	408 (767)	489 (913)	443 (830)	420 (788)
Exhaust Emission Data						
HC (Total Unburned Hydrocarbons)	0.27 (103)	0.15 (63)	0.08 (39)	0.05 (25)	0.07 (33)	0.08 (37)
NOx (Oxides of Nitrogen as NO_2)	3.3 (1300)	3.4 (1470)	4.7 (2190)	6.1 (2880)	5.2 (2440)	4.9 (2270)
CO (Carbon Monoxide)	0.4 (150)	0.2 (80)	0.2 (80)	0.4 (190)	0.2 (100)	0.2 (80)
PM (Particulate Matter)	0.19 (64)	0.08 (29)	0.05 (20)	0.05 (20)	0.04 (18)	0.05 (19)
SO_2 (Sulfur Dioxide)	0.005 (1.8)	0.005 (1.8)	0.005 (1.8)	0.004 (1.7)	0.005 (1.8)	0.005 (1.8)
Smoke (FSN)	0.89	0.52	0.44	0.53	0.43	0.44

All values (except smoke) are cited: g/BHP-hr (mg/Nm³ @ 5% O2)

Test Conditions

Steady-state emissions recorded per ISO8178-1 during operation at rated engine speed (+/-2%) and stated constant load (+/-2%) with engine temperatures, pressures and emission rates stabilized.

Fuel Specification:	40-48 Cetane Number, 0.0015 Wt.% Sulfur; Reference ISO8178-5, 40 CFR 86, 1313—98 Type 2-D and ASTM D975 No. 2-D. Fuel Density at 0.85 Kg/L (7.1 lbs/US Gal)
Air Inlet Temperature	25 °C (77 °F)
Fuel Inlet Temperature:	40 °C (104 °F)
Barometric Pressure:	100 kPa (29.53 in Hg)
Humidity:	NOx measurement corrected to 10.7 g/kg (75 grains H_2O/lb) of dry air
Intake Restriction:	Set to 20 in of H_2O as measured from compressor inlet
Exhaust Back Pressure:	Set to 1.5 in Hg
Note:	mg/m³ values are measured dry, corrected to 5% O_2 and normalized to standard temperature and pressure (0°C, 101.325 kPa)

The NOx, HC, CO and PM emission data tabulated here are representative of test data taken from a single engine under the test conditions shown above. Data for the other components are estimated. These data are subjected to instrumentation and engine-to-engine variability. Field emission test data are not guaranteed to these levels. Actual field test results may vary due to test site conditions, installation, fuel specification, test procedures and instrumentation. Engine operation with excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may results in elevated emission levels.