August 31, 2018

Mr. Ken Alex, Director
Office of Planning and Research
Office of Governor Edmund G. Brown Jr.
1400 10th Street
Sacramento, California 95814

Dear Mr. Alex:

The Jobs and Economic Improvement through Environmental Leadership Act (Assembly Bill 900 (AB 900), statutes of 2011) authorizes the Governor to certify a leadership project for streamlining under the California Environmental Quality Act (CEQA) if the project meets certain conditions. One condition for certification is that the project does not result in any net additional emissions of greenhouse gases (GHG), including GHG emissions from employee transportation, as determined by the California Air Resources Board (CARB).

California Barrel Company, LLC (the Applicant) submitted an application to CARB on July 16, 2018, for the proposed Potrero Power Station Mixed-Use Project (Proposed Project). As required by the Governor's Guidelines for Streamlining Judicial Review under CEQA, the application includes proposed GHG quantification methodologies and supporting documentation. CARB staff conducted an evaluation of the GHG emissions estimates submitted by the Applicant, and confirmed that the Applicant's methodology, calculations, and documentation are adequate. Based on the documentation submitted by the Applicant, CARB has determined that the Proposed Project will not result in any net additional GHG emissions for purposes of certification under AB 900. CARB staff's evaluation and an Executive Order noting CARB's determination are enclosed.

If you have any questions regarding the evaluation or determination, please contact Ms. Nicole Dolney, Chief of Transportation Planning Branch, Air Quality Planning and Science Division at (916) 322-1695 or by email at nicole.dolney@arb.ca.gov.

Sincerely,

Richard W. Corey
Executive Officer

Enclosures

cc: See next page.

cc: (via email)

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State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER G-18-080

Relating to Determination of No Net Additional Greenhouse Gas Emissions Under Public Resources Code section 21183, subdivision (c) for Potrero Power Station Mixed-Use Project

WHEREAS, in September 2011, Governor Brown signed the "Jobs and Economic Improvement through Environmental Leadership Act" (AB 900);

WHEREAS, under AB 900, the Governor may certify certain projects for judicial streamlining under the California Environmental Quality Act (CEQA) if certain conditions are met;

WHEREAS, under California Public Resources Code section 21183, subdivision (c), one condition for the Governor's certification is that the project does not result in any net additional emissions of greenhouse gases (GHG), as determined by the California Air Resources Board (CARB);

WHEREAS, the Governor's Guidelines for Streamlining Judicial Review under the California Environmental Quality Act require for purposes of CARB's determination on GHG emissions that an applicant submit electronically to CARB a proposed methodology for quantifying the project's net additional GHG emissions and documentation that the project does not result in any net additional GHG emissions;

WHEREAS, pursuant to the Governor's Guidelines, California Barrel Company, LLC (the Applicant) submitted its proposed GHG quantification methodologies and documentation to CARB on the proposed Potrero Power Station Mixed-Use Project (proposed project) on July 16, 2018, and the application was deemed complete;

WHEREAS, the application submitted for the proposed project estimates the project's GHG emissions as follows:

1. Construction GHG Emissions: Additional 42,453 metric tons CO_2e emissions from project construction and demolition activities. Construction-generated GHG emissions were estimated from equipment used for construction activities and from both on-site and off-site vehicles and equipment;

2. Operation-Related GHG Emissions: a maximum 23,963 metric tons CO_2e emissions during the first full year of project operation (2036) and declining operational emissions in future years over the lifetime of the project.

WHEREAS, CARB staff reviewed and evaluated the application in consultation with the lead agency (the City and County of San Francisco);

WHEREAS, CARB staff conducted an evaluation of the GHG emissions estimates included in the application submitted by the applicant and confirmed the documentation provides an adequate technical basis for estimating total GHG emissions for the proposed project;

WHEREAS, CARB's review and determination on the proposed project's GHG emissions is for the limited purpose of the Governor's findings and certification under AB 900 and should not be construed as meeting any other requirement under State or federal law, including CEQA; the lead agency remains responsible for full CEQA compliance for this project;

WHEREAS, CARB staff reviewed and evaluated the application and determined that the emissions associated with the project would not exceed the baseline at any time during project construction or during the project's operational lifetime;

NOW, THEREFORE, based on CARB Staff's Evaluation (Attachment 1) of the documentation submitted by the Applicant (Attachment 2), I determine that the Potrero Power Station Mixed-Use Project will not result in any net additional GHG emissions pursuant to Public Resources Code section 21183, subdivision (c) for purposes of certification under AB 900.

Executed this 31st day of August 2018, at Sacramento, California.

Richard W. Corey
Executive Officer

Attachments

1. CARB Staff Evaluation of AB 900 Application for Potrero Power Station Mixed-Use Project

2. Application for CEQA Streamlining GHG Emissions methodology and Documentation, Potrero Power Station Mixed-Use Development Project

ATTACHMENT 1 to CARB Executive Order G-18-080

CARB Staff Evaluation of AB 900 Application for Potrero Power Station Mixed-Use Project

CARB Staff Evaluation of AB 900 Application for Potrero Power Station Mixed-Use Project

August 31, 2018

I. Introduction

California Barrel Company, LLC (the Applicant) proposes to redevelop the 29 acre property located at 1201A Illinois Street, the site of the former Potrero Power Plant located within the Central Waterfront Plan Area of San Francisco. The proposed project would include construction of a mix of land uses including 2,400 to 3,000 dwelling units (du), between 1.2 and 1.9 million gross square feet (gsf) of commercial uses, 2,622 vehicle parking spaces, 6.3 acres of public open space, and 25,000 gsf of entertainment and assembly uses. The proposed project would result in the demolition of the existing structures on the power station site, which contains approximately 107,000 gsf of vacant buildings and facilities that were used as warehouses, parking, vehicle storage, and office spaces associated with the former plant. The Potrero Power Plant was decommissioned in 2011 for a variety of reasons, one of which was for redevelopment purposes. The Applicant is seeking certification for the project under Assembly Bill 900 (AB 900), the Jobs and Economic Improvement through Environmental Leadership Act.

AB 900 provides for streamlined judicial review under the California Environmental Quality Act (CEQA) if certain conditions are met. One condition is that the proposed project does not result in any net additional greenhouse gas (GHG) emissions as determined by the California Air Resources Board (CARB). This is the only condition that involves a determination by CARB. CARB staff prepared this technical evaluation of the GHG emissions from the proposed project as part of its determination.

This evaluation includes an executive summary, an overview of the AB 900 zero net additional GHG emissions requirement, a brief description of the proposed project, a technical review and assessment of GHG emissions information provided by the Applicant in its AB 900 application, and CARB staff's recommendation on the AB 900 GHG emissions determination for the proposed project.

II. Executive Summary

CARB staff reviewed the projected GHG emissions provided by the Applicant and confirmed that the GHG emission factors used to estimate baseline, construction, and operational emissions are reasonable. Staff concurs with the GHG quantification in the Applicant's proposal (Attachment 2).

Based on an evaluation of the documentation provided by the Applicant, CARB staff concludes that the proposed project would not result in any net additional GHG emissions relative to the baseline as summarized in Tables 1 and 2 below. CARB staff confirms that the proposed project would meet the GHG emissions requirements of the Jobs and Economic Improvement through Environmental Leadership Act. (Pub. Resources Code, §21178 et seq.) A detailed description of emissions by source is reviewed in subsequent sections.

Table 1 shows the baseline GHG emissions associated with the closure of the former Potrero Power Plant. The baseline emissions for this project are represented by the difference in GHG emissions from operation of the former Potrero Power Plant averaged over the last 10 years of operation leading up to its closure, and the corresponding ongoing GHG emissions that resulted from migrating the former power plant's electricity generation over to the Pacific Gas and Electricity (PG&E) utility grid– the main supplier of electricity to the City and County of San Francisco. The baseline emissions were calculated based on a range of the operational electricity generation statistics from the power plant leading up to its closure. According to the GHG Emissions Reporting Tool maintained by CARB, the average annual GHG emissions reported for the Potrero Power Plant facility from 2008 through 2010 was approximately 323,000 MT CO_2e/year.[1] The range of emissions reported by the applicant for the Potrero Power Plant is reasonable, and the low end of the range was used as a conservative estimate of baseline emissions for purposes of CARB staff's evaluation.

Table 1: Baseline GHG Emissions[1]

Facility	GHG Intensity (lb CO_2e/MWh)	GHG Emissions (MT CO_2e/year)	
		Low	High
Potrero Power Plant (2001-2010 Average)	1,259	220,280	648,370
PG&E (2011-2015 Average)	423	74,010	217,840
Difference	836	146,270	430,530

Notes:
GHG = greenhouse gas; lb = pounds, MT CO2e = Metric tons carbon dioxide equivalent; MWh = megawatt hour; PG&E = Pacific Gas and Electric
[1] Source: based on documentation provided in Attachment 2, and confirmed by CARB staff.

[1] California Air Resources Board. 2018. The California GHG Emissions Reporting Tool. https://www.arb.ca.gov/ei/tools/pollution_map/doc/2010/fac2010_100251_Public.pdf. Accessed July 2018.

Proposed project construction is expected to be completed over multiple phases spanning nearly 15 years, with initial construction activities beginning in 2020. The first phases of the proposed project are expected to become operational as early as 2025. Therefore, construction activities and operational activities would be concurrent for an approximately 10 year period from 2025-2034. Full project operation is estimated to commence in 2035.

Table 2 summarizes the first 30 years of project construction- and operation-related GHG emissions. At no point during the project's lifetime would the proposed project's emissions exceed the baseline.

Table 2: Comparison of Baseline and Project Operation-Related GHG Emissions[1]

Year[2]	GHG Emissions (MT CO_2e/year)			
	Construction	**Operational**	**Total**	**Baseline**
2020	2,184	-	2,184	146,270
2023	2,175	-	2,175	146,270
2024	3,748	-	3,748	146,270
2025	3,140	-	3,140	146,270
2026	5,173	-	5,173	146,270
2027	4,599	7,423	12,022	146,270
2028	2,062	10,957	13,019	146,270
2029	3,454	10,734	14,188	146,270
2030	3,046	13,646	16,692	146,270
2031	1,872	13,392	15,264	146,270
2032	4,338	13,168	17,506	146,270
2033	3,555	18,368	21,923	146,270
2034	1,882	21,889	23,771	146,270
2035	701	21,584	22,285	146,270
2036	526	**23,963**	**24,489**	146,270
2037	-	23,667	23,667	146,270
2038	-	23,392	23,392	146,270
2039	-	23,131	23,131	146,270
2040	-	22,878	22,878	146,270
2041	-	22,639	22,639	146,270
2042	-	22,411	22,411	146,270
2043	-	22,189	22,189	146,270
2044	-	21,972	21,972	146,270
2045	-	21,761	21,761	146,270
2046	-	21,553	21,553	146,270
2047	-	21,345	21,345	146,270
2048	-	21,138	21,138	146,270
2049	-	20,933	20,933	146,270
2050	-	20,734	20,734	146,270
Annual Maximum			**24,489**	
Total Construction Emissions	**42,453 MT CO_2e**	**-**	**-**	**-**

Notes: GHG = greenhouse gas; MT CO_2e = Metric tons carbon dioxide equivalent.
[1] Source: as documented in Attachment 2, and confirmed by CARB staff.

[2] The applicant estimated project-related GHG emissions for the first 30 years from project initiation. The project would result in no net increase in GHG emissions above the baseline at any point, and it is anticipated that project-generated emissions would continue to decline in the future due to declining emission factors. Thus, it is reasonable to expect that the project would remain GHG-neutral during its lifetime.

III. Overview of AB 900

AB 900, as amended by SB 743 (2013), SB 734 (2016), and AB 246 (2017) provides streamlined judicial review for development projects if, among other conditions, the "project does not result in any net additional emissions of greenhouse gases, including greenhouse gas emissions from employee transportation, as determined by the State Air Resources Board pursuant to Division 25.5 (commencing with Section 38500) of the Health and Safety Code." (Pub. Resources Code, §21183, subd. (c).)

The Governor's Guidelines for AB 900 applications require applicants to submit a proposed methodology for quantifying the project's GHG emissions and documentation that the project will not result in any net additional GHG emissions. The documentation must quantify direct and indirect GHG emissions associated with the project's construction and operation, including GHG emissions from employee transportation, and the net emissions of the project after accounting for any mitigation measures. The project's net emissions, after mitigation, must be monitored and enforced consistent with Public Resources Code section 21183, subdivision (e).

The role of CARB in reviewing AB 900 applications for purposes of the Governor's certification is limited to an evaluation of the quantification methods and documentation submitted by the Applicant to determine whether the project would result in no net additional emissions of GHG emissions. CARB staff evaluated the technical elements of the project application, including existing emissions in the absence of the project (i.e., baseline), input data and assumptions, quantification methods, and an estimate of the project's net GHG emissions.

IV. Existing Conditions

The proposed project site is located at located at 1201A Illinois Street, the site of the former Potrero Power Plant, in the Central Waterfront Plan Area of San Francisco. The existing structures on the site include approximately 107,000 gsf of vacant buildings and facilities that were used as warehouses, parking, vehicle storage, and office spaces associated with the former power plant. The existing baseline would normally be the GHG emissions associated with ongoing operations at the project site at the time the Notice of Preparation for the project was published. For this project, CARB staff has accepted an alternative baseline for AB 900 purposes for reasons described below.

The Potrero Power Plant began operating in 1901. Beginning in 2001, the San Francisco Board of Supervisors adopted nine different resolutions and ordinances pertaining to the shutdown of the plant. The plant shut down in 2011, pursuant to a 2009 Settlement Agreement between the plant operator (Mirant Potrero, LLC) and the City and County of San Francisco (City) to resolve long-standing disputes between the parties.[2] The agreement included several inducements for the plant's closure, including redevelopment of the site and priority processing for transit-oriented development by the City.

Plant operations would have to cease as a condition for the plant to be eligible for redevelopment following shutdown. Because redevelopment was one of the primary inducements to shut down the power plant, CARB staff believes it is reasonable to include the former power plant's operational emissions, less the replacement emissions associated with transferring the plant's electricity generation over to PG&E's electrical grid via the Transbay Cable, as the baseline for AB 900 purposes.

V. Proposed Project Description

California Barrel Company, LLC (the Applicant) purchased the project site NRG Potrero LLC (formerly Mirant Power, LLC) in 2016. The project proposes to redevelop the 29 acre property located at 1201A Illinois Street, the site of the former Potrero Power Plant located within the Central Waterfront Plan Area of San Francisco. The proposed project would include construction of a mix of land uses including 2,400 to 3,000 dwelling units (du), between 1.2 and 1.9 million gsf of commercial uses, 2,622 vehicle parking spaces (including 50 car share spaces), 6.3 acres of public open space, and 25,000 gsf of entertainment and assembly uses. The proposed project would result in the demolition of approximately 20 existing structures on the power station site, which contains approximately 107,000 gsf of vacant buildings and facilities that were used as warehouses, parking, vehicle storage, and office spaces. The baseline and proposed land uses are summarized in Table 3.

[2] City and County of San Francisco. 2009. Settlement Agreement. https://www.sfcityattorney.org/wp-content/uploads/2009/08/MIRANT-CLOSURE-SETTLEMENT.pdf. Accessed July 30, 2018.

Table 3: Baseline and Proposed Land Uses

Land Use Type	Baseline Land Uses to be Demolished	Proposed Land Uses
Residential/Apartments	-	2,400-3,000 du
Commercial	107,000 gsf	1.2 and 1.9 million gsf
Entertainment/Assembly	-	25,000 gsf
Open Space/Amenities	-	6.3 acres
Vehicle Parking	-	2,622 spaces

Notes:
du = dwelling units, gsf = gross square feet
Source: as documented in Attachment 2.

The proposed project would include vehicular, bicycle, and pedestrian improvements to adjacent streets. The project proposes 1,829 bicycle parking spaces. The project site proposes a transit bus stop and a bicycle and pedestrian network with off-site connections.

The proposed project would be required to comply with San Francisco Planning Code Section 169, Transportation Demand Management Program (added by Ordinance 34-17, approved February 2017), and would seek Leadership in Energy and Environmental Design (LEED) Gold certification, which includes measures applicable to both construction and operation phases.

VI. Technical Review and Assessment

Ramboll, on behalf of the Applicant, prepared a GHG emissions assessment for the proposed project to demonstrate that the requirements of AB 900 can be met. A full copy of this proposal can be found in Attachment 2.

The Applicant relied upon a variety of sources for activity data and emission factors to quantify GHG emissions. This CARB staff evaluation is focused on reviewing the data sources, emission factors, emission calculations, and assumptions used for the application, and determining whether these sources and assumptions are reasonable.

The Applicant relied upon Version 2016.3.2 of the California Emissions Estimator Model (CalEEMod), a widely-used emissions quantification tool developed in coordination with local air districts to quantify criteria pollutant and GHG emissions from land use development projects in California. CalEEMod uses widely-accepted sources for emission estimates combined with appropriate default data that can be used if site-specific information is not available. CalEEMod is populated with data from the

United States Environmental Protection Agency (US EPA) AP-42 emission factors, CARB's on-road and off-road equipment emission models such as the Emission Factor 2014 model (EMFAC2014), and the Off-road Emissions Inventory Program model (OFFROAD). The Applicant based calculations of GHG emissions on project-specific data available from the project sponsor where possible. The Applicant also relied on utility-specific carbon intensities to calculate emission factors for the baseline condition.

VII. Baseline Operational Emissions

The baseline emissions for this project are represented by the difference in GHG emissions from operation of the former Potrero Power Plant averaged over the last 10 years of operation leading up to its closure, and the corresponding ongoing GHG emissions that resulted from transferring the former power plant's electricity generation over to the Pacific Gas and Electricity (PG&E) utility grid—the main supplier of electricity to the City and County of San Francisco. The baseline emissions were calculated based on a range of the operational electricity generation statistics from the power plant leading up to its closure. The application states that GHG emissions associated with the baseline would range from 146,270 and 430,530 MT CO_2e per year.

CARB staff evaluated the Applicant's GHG emission estimations, demand factors, and assumptions used in the Applicant's baseline calculations, summarized in Table 1 above. CARB staff concluded that the methodology and estimated baseline GHG emissions provided by the Applicant are appropriate. The low end of the range represents a conservative estimate of the baseline emissions for this project.

VIII. Project Construction Emissions

Construction-related GHG emissions, including demolition-related emissions, are one time, direct emissions and would occur over an approximately 15-year construction period. The Applicant estimated GHG emissions associated with project construction by using project-specific construction equipment inventories and use data provided by the project sponsor, fuel consumption rates provided by US EPA, and emission factors from the CalEEMod tool and CARB data sources. The Applicant estimates a total of 42,453 metric tons carbon dioxide equivalent (MT CO_2e) over the project construction period, as shown in Table 2 above. Construction-related GHG emissions reflect the types of equipment expected and the number of hours of operation anticipated over the construction schedule. This includes heavy-duty equipment, such as material hauling trucks, excavators, cranes, and conventional work vehicles.

CARB staff concluded that the methodology and estimated GHG emissions provided by the Applicant for construction are appropriate.

IX. Proposed Project Operational Emissions

Operational GHG emission sources from the proposed project include mobile, electricity, natural gas, area, stationary, solid waste, water, and wastewater sources. Operational GHG emissions from the proposed project were assumed to begin in 2025, and are summarized concurrently with construction emissions in Table 2 above.

The proposed project is seeking LEED Gold certification. At the time of this analysis, the exact LEED credits and project features that would be selected to achieve LEED Gold certification have not yet been determined.

Mobile-source emission factors used were based on the CARB EMFAC2014 on-road inventory as reflected in CalEEMod. Declining mobile-source emission factors were used to estimate GHG emissions from vehicles over the project's lifetime, which reflect additional improvements in fleet fuel economy due to CARB's Advanced Clean Cars regulations, and were not reflected in CalEEMod. Mobile-source emissions were also calculated based on project-specific vehicle trip estimates provided by the project sponsor.

CalEEMod default emission factors and calculation methods were also used to estimate GHG emissions from electricity, natural gas, solid waste disposal, water consumption, and area sources. CalEEMod default electricity usage was scaled based on consumption factors provided by the project sponsor. Declining electricity emission factors were used to reflect compliance with renewable portfolio standards over the course of the project lifetime. Estimates of energy-related GHG emissions from the project do not account for LEED Gold certification or other energy efficiency features of the project. Therefore, the estimate of GHG emissions from project-related energy consumption is conservative. The Applicant also assumed 50 hours per year operation for 15 emergency generators.

The Applicant's assumptions and inputs are reasonably conservative, and represent an upper-bound for the net increase in GHG emissions that could occur. CARB staff evaluated the proposed project's emission calculations, demand factors, and assumptions used to estimate operational GHG emissions and concluded that the methodology and estimated operational GHG emissions provided by the Applicant are appropriate.

Based on the Applicant's proposal, annual project construction and operational emissions would not exceed the baseline at any point during the project's lifetime, as summarized in Table 2.

X. Conclusions and Recommendations

Based on an evaluation of the documentation provided by the Applicant, CARB staff concludes that the proposed project will not result in any net additional GHG emissions relative to the baseline.

ATTACHMENT 2 to CARB Executive Order G-18-080

Application for CEQA Streamlining GHG Emissions Methodology and Document, Potrero Power Station Mixed-Use Development Project

Prepared for
San Francisco Planning Department
San Francisco, California

Prepared by
Ramboll US Corporation
San Francisco, California

Project Number
1690001653

Date
July 12, 2018

APPLICATION FOR CEQA STREAMLINING GHG EMISSIONS METHODOLOGY AND DOCUMENTATION

POTRERO POWER STATION MIXED-USE DEVELOPMENT PROJECT
1201A ILLINOIS STREET
SAN FRANCISCO, CALIFORNIA

RAMBOLL

CONTENTS

ACRONYMS AND ABBREVIATIONS

AB32:	(California) Assembly Bill 32 (Nuñez)
AB900:	(California) Assembly Bill 900 (Buchanan)
ARB:	(California) Air Resources Board
BAAQMD:	Bay Area Air Quality Management District
CalEEMod®:	California Emissions Estimator Model
CAPCOA:	California Air Pollution Control Officers Association
CEC:	California Energy Commission
CEQA:	California Environmental Quality Act
CFR:	Code of Federal Regulations
CH_4:	methane
CO_2e:	carbon dioxide equivalents
EIR:	Environmental Impact Report
EMFAC2014:	EMission FACtor model version 2014
g/hp-hr:	gram per horsepower-hour
GHG:	greenhouse gas
GSF:	gross square feet
GWP:	global warming potential
kWh:	kilowatt-hour
m:	meter
mph:	miles per hour
MT:	metric tonne
N_2O:	nitrous oxide
PG&E:	Pacific Gas and Electric Company
RPS:	Renewables Portfolio Standard
yr:	year

1. INTRODUCTION

The proposed Potrero Power Station Mixed-Use Development Project (herein referred to as the "Project") has applied for California Environmental Quality Act (CEQA) judicial streamlining under Public Resources Code (PRC) Section 21178 et seq. In support of the Application, Ramboll quantified both direct and indirect greenhouse gas emissions associated with the Project's construction and operation, to show the Project meets the requirement for no "net additional emission of greenhouse gases [GHG], including greenhouse gas emissions from employee transportation" [California PRC §21183(c)].

Ramboll quantified potential operational GHG emissions for the Project as well as the Project's one-time emissions due to construction. Additionally, Ramboll quantified the GHG emissions associated with the operation of the Potrero Power Plant (the "Plant") in its final years of operation, noting that these represent the avoided GHG emissions due a settlement agreement with the City and County of San Francisco which led to redevelopment of the Site and ultimate development of the Project. Finally, a comparison between the Project GHG emissions (disaggregated year-by-year out to 2050) and avoided GHG emissions due to the closure of the Plant is presented which shows that the Project meets the GHG emissions requirements for AB900 CEQA streamlining. This document summarizes of the assumptions and calculation methodologies that were used to estimate GHG emissions.

Throughout this report, GHG emissions are reported in units of metric tons of carbon dioxide equivalents (MT CO_2e). Carbon dioxide equivalents are emissions of carbon dioxide, methane (CH_4), and nitrous oxide (N_2O), weighted by the global warming potentials (GWP) from Title 40 of the Code of Federal Regulations (CFR), Part 98, Table A-1, as referenced by the California Mandatory Reporting Rule for GHG (Title 17 of the California Code of Regulations, §§95100-95158). GHG emissions are quantified for this Project, operation of the Plant in its final years of operation, and one-time emissions associated with Project construction.

1.1 Project

The Proposed Project would be located at 1201A Illinois Street in San Francisco, California, just south of the area known as Pier 70 and east of the Potrero Hill and Dogpatch neighborhoods. It is the former Potrero Power Plant, bordered by 22nd Street to the north, the San Francisco Bay to the east, 23rd Street to the south and Illinois Street to the west. The Project site is comprised of a 21-acre Power Station site, a 4.8-acre site owned by Pacific Gas & Electric Company (PG&E), a 2.9-acre site owned by the Port of San Francisco (Port), a 0.18-acre site owned by a private party, and a less than 0.1-acre site owned by the City and County of San Francisco. Currently, the Power Station Site contains approximately 107,000 gross square feet (gsf) of vacant buildings and facilities that were used as warehouses, parking, vehicle storage, and office spaces. The PG&E site is currently used as a staging area for construction equipment and houses power transmission equipment.

Overall, the proposed project would construct up to approximately 5.4 million gross square feet (gsf), of uses, including between 2.4 and 3.0 million gsf of residential uses (about 2,400 to 3,000 dwelling units), between 1.2 and 1.9 million gsf of commercial uses (office, R&D/life science, retail, hotel, and PDR), and approximately 922,000, 100,000, and 25,000 gsf of parking, community facilities and entertainment/assembly uses, respectively. Most new buildings would range in height from 65 to 180 feet, with one building at 300 feet. Approximately 6.3 acres would be devoted to publicly accessible open space.

Project construction would likely occur in eight overlapping phases (Phase 0, Phase 0.1, and Phases 1 through 6), with each phase lasting approximately three to five years. Total construction is estimated to occur over a 15-year period, and is anticipated from the beginning of 2020 through 2034, as shown in **Table 1**. According to the Project phasing diagram shown in **Table 2**, the first operational year of the Project would be 2025 with the occupancy of Phase 1 buildings. The Project's GHG emissions inventory is also presented for each year from 2020 to 2050 in **Table 10**. Operational emissions from full Project buildout are expected to change each year due to the phase-in of the Renewable Portfolio Standard (RPS) goals and improved CO_2e emission factors resulting from a more efficient vehicle fleet.

Methodologies for quantifying GHG emissions associated with Project operation are presented in Section 2.

1.2 One-Time Emissions

Construction of the Project will generate "one-time" emissions, that is, discrete emissions that are not associated with ongoing Project operation. These emissions are quantified and disclosed for the Project. Methodologies for quantifying construction GHG emissions are detailed in Section 3. The project site, being primarily industrial in nature, currently has little vegetation other than occasional ruderal weeds, unmaintained vegetation, and a row of street trees site and on a short segment of the north side of 23rd Street (recently planted as part of PG&E's substation work on 23rd Street). Thus, any changes in carbon sequestration from changes in vegetation due to the Project will be minimal and are not quantified.

1.3 Emissions Sources

Table 3 lists the sources for which GHG emissions from the Project are quantified as well as the methodologies that were used. These will be further explained in Sections 2 and 3. For "one-time" construction emissions, Ramboll calculated GHG emissions from off-road equipment and harbor craft, on-road mobile construction vehicles, as well as electricity needed for electric off-road equipment and construction water supply. For operational emissions, Ramboll quantified GHG emissions from emergency generators and transportation refrigeration units (for potential use at grocery stores), electricity usage by wastewater treatment, on-road mobile sources from vehicle traffic and operational area sources including architectural coating, hearths, landscaping equipment, consumer products, and building energy use.

2. PROJECT OPERATIONAL EMISSIONS

The estimated GHG emissions from Project operation is shown in **Table 9**. GHG emissions are modeled for full buildout in 2034 as well as for each interim year when a new phase begins operations. The PPS Project will be built in several phases; as presented in **Table 1**, Phase 1 construction will be completed and start operating in year 2025 and subsequent interim phases (2, 3, 4, 5) will start operating in years 2026, 2028, 2031, and 2032, respectively. The full build out will start operating in 2034.

To estimate operational emissions, the year in which construction is completed for each Phase is modeled using the California Air Pollution Control Officers Association (CAPCOA)-developed model for land uses, California Emissions Estimator Model, version 2016.3.2 (CalEEMod®).[1] Emissions estimates from CalEEMod® are then scaled by expected changes in electricity GHG intensity and fleet-average GHG emission factors for each future year. This is shown in **Table 10**. Operational GHG emissions from area sources, natural gas use, waste, and generators were assumed to be the same as those in the start year of each overlapping phase because the emission factors do not vary by year.

At full buildout, the Project would emit 23,963 MT CO_2e/year in operational emissions with mobile sources as the largest contributor of GHG emissions, followed by energy use.2

2.1 Energy

Energy usage from the Project was estimated using in CalEEMod® with Project-specific type and size of land uses corresponding to a minimum residential/maximum commercial development scenario. User-defined inputs for project location, operational year, and climate zone were also used. The energy emissions estimates consider emissions from two processes, electricity generation and natural gas combustion, with further details in Section 2.1.1 and 2.1.2 below.

2.1.1 Electricity

Determining GHG emissions from electricity generation requires an emission factor correlating megawatt-hours (MWh) of electricity consumed to MT CO_2e. The emission factor for GHG from electricity production for customers of the Pacific Gas and Electric Company (PG&E) is derived for future years in **Table 4**. The GHG intensity factor for total electricity energy delivered in future years are based on the historical carbon intensity of PG&E energy delivery from the most recent three years (2014, 2015 and 2016) and projected Renewables Power Standard (RPS) goals for 2020, 2030 and 2050. **Table 5** shows the difference between the CalEEMod® default electricity intensity factor (based on 2008 data) and the projected intensity factors (at modeled operation years) which account for the RPS. The CH_4

[1] CalEEMod® calculates annual GHG emissions which can be used in support of analyses in environmental documents such as Environmental Impact Reports (EIRs) and Negative Declarations used to support a California Environmental Quality Act (CEQA) evaluation. CalEEMod® utilizes widely accepted models for emission estimates combined with appropriate default data that can be used if site-specific information is not available. These models and default estimates use sources such as the United States Environmental Protection Agency (USEPA) AP-42 emission factors, California Air Resources Board (ARB) onroad and offroad equipment emission models such as the EMission FACtor 2011 model (EMFAC2011) and the Offroad Emissions Inventory Program model (OFFROAD), and studies commissioned by California agencies such as the California Energy Commission (CEC) and Calrecycle. Available at: http://www.caleemod.com/

[2] The first operational year at full buildout will be in 2034. Total emissions during that year are 24,489 MT CO_2e/year, which includes 523 MT CO_2e/year in construction emissions.

and N_2O emission factors are the same as those used in CalEEMod®. The electricity GHG intensity factor for interim years in between 2020, 2030 and 2050, shown in **Table 10**, are linearly interpolated between the intensity factors derived in **Table 4**.

Electricity usage is taken from the Project CalEEMod outputs using CalEEMod defaults and scaled up by a ratio of 1.4 to reflect higher building electricity demand estimates by the Project sponsor for the full build out. The scaling factor of 1.4 is calculated using the build out electricity demand estimated by the Sponsor (53,632 kwh/year) divided by the CalEEMod estimates (39,092 kwh/year).

Emissions from electricity use are the product of the annual electricity use and the GHG emission factor derived for that year.

2.1.2 Natural Gas

Emissions from natural gas use are estimated using CalEEMod® default values for CO_2, CH_4, and N_2O emission factors from natural gas combustion and natural gas demand based on default CalEEMod® energy intensities for Project-specific type and size of land uses corresponding to a minimum residential/maximum office development scenario and user-defined inputs for project location, operational year, and climate zone.

2.2 Mobile Sources

Mobile-source emissions would result from vehicle trips (auto and truck) associated with the proposed project and were calculated using the CalEEMod® model based on the number of vehicle trips identified in the transportation impact study prepared for the project.[3]

As discussed above, CalEEMod® is used to model GHG emissions from mobile sources corresponding to the starting operational year for each phase (Phase 1 - 2025; Phases 1 to 2 - 2026; Phases 1 to 3 - 2028; Phases 1 to 4 - 2031; Phases 1 to 5 - 2032) and build out year (Phases 1 to 6 - 2034). Mobile-source GHG emissions in the interim years in between the modeled years, shown in **Table 10**, are adjusted using the year-to-year percentage change in fleet-average GHG emission factor from EMFAC2014.

2.3 Waste

Solid waste treatment releases GHG, primarily methane, as a result of decomposition. Emissions from solid waste treatment are estimated using CalEEMod® default values for CO_2, CH_4, and N_2O emission factors and default CalEEMod® solid waste disposal rates for Project-specific type and size of land uses corresponding to a minimum residential/maximum office/maximum hotel development scenario and user-defined inputs for project location, operational year, and climate zone.

2.4 Water

Water treatment and transport results in direct and indirect emissions of GHGs. Indirect GHG emissions are generated from electricity needed to supply, treat and distribute water as well as electricity required to treat wastewater. Direct GHG emissions result from septic tank, aerobic and facultative lagoon wastewater treatment. Emission factors are based on CalEEMod® defaults.

Indoor and outdoor water use is based on default CalEEMod® water use rates for Project-specific type and size of land uses corresponding to a minimum residential/maximum office

[3] Adavant Consulting, Memorandum: Potrero Power Station Mixed-use Development Project Estimation of Project Travel Demand, December 1, 2017.

development scenario and user-defined inputs for project location, operational year, and climate zone.

GHG emissions from water usage are the product of water used per year and the CO_2e emission factors for water use and treatment.

2.5 Area Sources

The Project includes area sources such as landscaping equipment. GHG emissions from area sources were estimated using CalEEMod® for Project-specific type and size of land uses corresponding to a minimum residential/maximum office development scenario and user-defined inputs for project location, operational year, and climate zone.

2.6 Emergency Generators

Potential diesel fuel consumption from 15 emergency diesel generators (stationary sources) were estimated based on their horsepower rating and a fuel consumption rate of 0.05 gallons/horsepower-hour[4] as shown in **Table 8**. The analysis conservatively assumes that each parcel with designated building height limits in excess of 75 feet would require such equipment. All emergency generators range in size from 120 kilowatts (kW) to 2,000 kW as per information provided by the project sponsor. It was assumed that proposed generators would operate 50 hours per year (consistent with BAAQMD permitting limits).

GHG emissions from operational emergency generators are the product of diesel fuel consumption per year and the CO_2e emission factors for operational generators. The GHG emission factor for operational generators are taken from the US EPA's Emission Factors for Greenhouse Gas Inventories.[5]

2.7 Transportation Refrigeration Units (TRUs)

GHG emissions from transportation refrigeration units (TRUs) were estimated for refrigerated trucks servicing the grocery store anticipated to be built in Block 5 (Phase 4).

TRU emissions were calculated using the engine operating hours multiplied by the engine size, load factor, and GHG emission factors from California Air Resources Board OFFROAD2017 and OFFROAD2007 model. Fleet-average CO_2 emission factors are based on year 2031 (the first year of operation of Phase 4) and are conservative estimates for future years when TRU engines are expected to become more efficient.

Operating hours were estimated based on the truck travel time plus unloading time. Truck travel time is calculated as distance based on CalEEMod® default value of 7.3 miles per one-way trip for a Commercial Non-Work Trip, divided by the travel speed of 10 miles per hour, assuming 5 trucks per day. Loading time is based on average delivery time of 27 minutes from McCormack et al. (2010).[6] The Project proposes a mitigation option to plug in TRUs during unloading, which would reduce diesel combustion GHG emissions and is expected to

[4] Fuel use factor of 0.05 gallons/horsepower-hour is based on SCAQMD CEQA Air Quality Handbook, Table A9-3E.

[5] US EPA's Emission Factors for Greenhouse Gas Inventories, available at https://www.epa.gov/sites/production/files/2015-07/documents/emission-factors_2014.pdf

[6] McCormack et al. (2010). "Truck Trip Generation by Grocery Stores", prepared by University of Washington for Transportation Northwest (TransNow) and Washington State Department of Transportation. Available online at: http://www.wsdot.wa.gov/NR/rdonlyres/E7164661-25E6-421B-B828-C2EF5F909180/0/TruckTripGenerationGroceryStoresreportAugust2010.pdf

offset any increase electricity GHG. However, the emissions estimated for the purposes of CEQA streamlining do not include this mitigation option and are therefore conservative.

3. ONE-TIME CONSTRUCTION EMISSIONS

The Project construction energy usage is shown in **Table 7** by construction phase for water usage, electric off-road equipment, diesel usage for off-road and on-road equipment and gasoline usage for on-road construction vehicles. Also shown in **Table 7** are the GHG emission factors used calculate GHG emissions from the corresponding energy use. Construction GHG emissions are assumed to occur uniformly throughout the duration of each phase and are correspondingly disaggregated by year in **Table 10**.

3.1 Off-Road Diesel Equipment

Ramboll estimated GHG emissions from construction equipment as the product of the equipment horsepower, total hours of operation, load factor, and CO_2 emission factor.

Project-specific construction equipment inventories that include details on the type, quantity, size, and hours of operation anticipated for each piece of equipment were provided by the construction contractor. In-water equipment usage was estimated using the methodology from the ARB's Emissions Estimation Methodology for Commercial Harbor Craft Operating in California.[7] Where required, Ramboll used CalEEMod® defaults for equipment load factors.

A diesel fuel consumption rate of 0.05 gallons/horsepower-hour[8] was assumed and GHG emission factors (tabulated in **Table 7**) were taken from the US EPA's Emission Factors for Greenhouse Gas Inventories.[96]

3.2 Construction Water Usage

Water usage during construction is required for dust control during operation of off-road equipment including tractors, loaders, graders, scrapers, backhoes and dozers. Equipment type, usage hours per day and days per phase were provided by the construction contractor. CalEEMod® defaults for soil disturbed per day[10] and water application rate of 3,020 gal/acre/day[11] is used to calculate total water usage.

Electricity use is calculated based on the CalEEMod® default BAAQMD energy intensity of 0.005411 kWh per gallon for supply, distribution, and treatment of water, and GHG emissions are calculated by multiplying total electricity use in a given year by the corresponding electricity GHG intensity projected for that year.

3.3 Electric Construction Equipment

Electric construction equipment is primarily used during building construction phases such as saws, impact guns and tower cranes.[12] Since information on electric construction equipment

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[7] California Air Resources Board. 2007. Emissions Estimation Methodology for Commercial Harbor Craft Operating in California. Available at: https://www.arb.ca.gov/regact/2010/chc10/appc.pdf

[8] Fuel use factor of 0.05 gallons/horsepower-hour is based on SCAQMD CEQA Air Quality Handbook, Table A9-3E.

[9] US EPA's Emission Factors for Greenhouse Gas Inventories, available at https://www.epa.gov/sites/production/files/2015-07/documents/emission-factors_2014.pdf

[10] Acres disturbed per day calculated from CalEEMod® Appendix A and Appendix D Table 3.7.

[11] Air & Waste Management Association. 1992. Air Pollution Engineering Manual.

[12] "Analysis of Energy Use Associated with the Proposed Golden State Warriors Project, San Francisco, California", Ramboll Environ. 2015. Available online at: http://www.gsweventcenter.com/GSW_RTC_References/2015_1019_Ramboll_Environ.pdf. Accessed June 25, 2018.

was not available from the construction contractor, Ramboll estimated construction equipment electricity use by scaling in proportion to project building square footage from the Event Center and Mixed-Use Development at Mission Bay Blocks 29-32 Draft Subsequent EIR. Electric construction equipment is not expected to be used during the first two years of construction when site grading occurs when building construction does not occur.

Year-by-year GHG emissions are calculated based on the electricity GHG intensity projected for each year.

3.4 Construction Trips

GHG emissions from on-road construction trips were calculated using the total number of worker, vendor and haul truck trips provided by the construction contractor.

Diesel fuel usage from on-road sources during construction was calculated from vendor and haul trips during each phase, and is shown in **Table 7**. For haul trucks, a 20-mile one-way trip length was used, based on CalEEMod® default truck trip lengths, and for vendor trucks a 7.3-mile trip length was used, based on the regional default vendor trip length from CalEEMod®. The fleet mix and fleet-average fuel efficiency for on-road vehicles operating during each sub-phase was obtained from ARB's EMission FACtor model (EMFAC2014) for the starting year of each sub-phase. Diesel GHG emission factors for on-road sources are taken from the California ARB Low Carbon Fuel Standard GREET model simulation for the ultra-low sulfur diesel production pathway.[13]

Gasoline fuel usage from on-road sources during construction was calculated from worker trips during each Phase, and is shown in **Table 7**. A default trip length of 10.8 miles from CalEEMod® was used. The fleet mix and fleet-average fuel efficiency for on-road vehicles operating during each sub-phase was obtained from EMFAC2014 for the starting year of each sub-phase. Gasoline GHG emission factors are taken from the California ARB Low Carbon Fuel Standard GREET model simulation for California Reformulated Gasoline Blendstock for Oxygenate Blending (CARBOB) production pathway.[14]

[13] California ARB Low Carbon Fuel Standard GREET model simulation for the ultra-low sulfur diesel production pathway, available at https://www.arb.ca.gov/fuels/lcfs/121514ulsd.pdf

[14] California ARB Low Carbon Fuel Standard GREET model simulation for California Reformulated Gasoline Blendstock for Oxygenate Blending (CARBOB) production pathway, available at https://www.arb.ca.gov/fuels/lcfs/121514carbob.pdf

4. COMPARISON OF NET GHG EMISSIONS

4.1 Project GHG Emissions

Table 10 shows the year-by-year Project GHG emissions between 2020 and 2050. The maximum yearly GHG emissions is 24,489 MT CO2e per year occurring in 2034, with operational emissions declining in subsequent years due to cleaner electricity and improved vehicle fuel economy.

4.2 Avoided GHG Emissions due to Closure of the Plant

The Plant shut down in January 2011, after completion of the Trans Bay Cable which provided the City of San Francisco with sufficient power as mandated by the California Independent System Operator (CAISO).[15] The Trans Bay Cable connects the Potrero Substation to the Pittsburg Substation in Pittsburg, CA. According to Trans Bay Cable, the Pittsburg Substation "receives power through transmission lines from many other power plants" including renewable sources.

Ramboll estimated the amount of GHG emissions avoided by closure of the Plant using the GHG intensity of electricity delivered by Pacific Gas & Electric (PG&E) – the main electricity supplier to the city of San Francisco – together with operational statistics of the Plant in the years leading up to its closure. Between 2011 and 2015, the GHG intensity of electricity supplied by PG&E averaged 423 lb CO_2e/MWh, as shown in **Table 12.**[16] US Energy Information Administration (US EIA) survey Form EIA-923 statistics indicate that, in the period 2001-2010 leading up to closure, the Plant produced between 385,621 to 1,135,034 MWh/year at an average carbon intensity of 1,259 lb CO_2e/MWh (see **Table 11**).[17] The replacement of the Plant with electricity from the PG&E grid (which is supplied by newer and more efficient natural gas and renewable-source power plants) resulted in approximately a factor of 3 reduction in GHG intensity of electricity, leading to 146,226 to 430,401 MT CO_2e avoided per year depending on the amount of electricity generated by the Plant as shown in **Table 12**.

4.3 Comparison of GHG Emissions

The comparison between Project GHG emissions and avoided GHG emissions from closure of the Plant shows that, even under the most restrictive case, maximum annual Project GHG emissions are approximately 17% of the minimum avoided annual GHG emissions from Plant closure.

4.4 Demonstration of No Net Additional Emissions of Greenhouse Gases

In support of this Application, Ramboll quantified both direct and indirect greenhouse gas emissions associated with the Project's construction and operation, to show the Project meets the requirement for no "net additional emission of greenhouse gases [GHG], including greenhouse gas emissions from employee transportation" [California PRC §21183(c)]. **Table 10** shows the year-by-year Project GHG emissions from 2020 to 2050, starting at a

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[15] "2010 Local Capacity Technical Analysis", California Independent System Operator, April 2009. http://www.caiso.com/Documents/Draft2010LCTStudyReport07-Apr-2009.pdf.

[16] Data obtained from The Climate Registry CRIS Public Reports (https://www.theclimateregistry.org/our-members/cris-public-reports/), also provided by PG&E (http://www.pgecurrents.com/2015/01/30/pge-cuts-carbon-emissions-with-clean-energy/).

[17] Detailed Electric Power Data (survey Form EIA-923), USEIA (2017). https://www.eia.gov/electricity/data/eia923/.

minimum of 2,183 MT CO_2e/year during the first year of construction. The maximum annual emissions occur in 2034 at 24,489 MT CO_2e/year and emissions decrease steadily to 20,339 MT CO_2e/year by 2050. Annual Project emissions never exceed the baseline considered here, the avoided annual GHG emissions from Plant closure conservatively estimated at 146,226 MT CO_2e/year. Therefore, there is a net reduction in GHG emissions for each year considered in this analysis.

One-time emissions from construction are included with the continual operational emissions in the evaluation against the baseline for this Project. Unlike projects where baseline activities are simply relocated, the baseline activity for this Project is the operation of a power plant that was shut down. There was no additional construction associated with moving the power plant to another location.

TABLES

Table 1: Project Construction Phasing
Potrero Power Station Mixed-Use Development Project
San Francisco, California

Phase[1]	Description	Start Year	End Year	# of Work Days
0	Demolition, Site preparation, and Rough Grading for the entire Project	January 2020	December 2022	782
0.1	Tank farm area subject to future PG&E remediation efforts	July 2024	October 2024	87
1	Grading, Building Construction (Blocks 8, 9, 12), Paving, Architectural Coating	July 2022	June 2025	782
2	Building Construction (Blocks 7, 11), Paving, Architectural Coating	January 2024	April 2026	607
3	Grading, Building Construction (Blocks 3, 4), Paving, Architectural Coating	January 2025	September 2028	977
4	Grading, Building Construction (Blocks 5, 6, 10), Paving, Architectural Coating	January 2027	July 2031	1194
5	Grading, Building Construction (Blocks 1, 2, 14), Paving, Architectural Coating	January 2030	August 2032	695
6	Grading, Building Construction (Block 13), Paving, Architectural Coating	January 2030	September 2034	1238

Notes:

[1] Project construction schedule provided by the Project Sponsor. Phase 0.1 is included within the boundary of Phase 0 but is subject to PG&E remediation efforts which could impact schedule for completion of work in this area.

Table 2: Phasing Diagram for PPS Project
Potrero Power Station Mixed-Use Development Project
San Francisco, California

Project	Project Activity	Construction and Operation Schedule																	
		2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
PPS	Phase 0			Phase 0															
	Phase 0.1							0.1											
	Phase 1						Phase 1												
	Phase 2							Phase 2											
	Phase 3								Phase 3										
	Phase 4										Phase 4								
	Phase 5													Phase 5					
	Phase 6																		

Legend:
- Construction Activity
- Operational Build-Out Year
- Operational Activity

Table 3: Energy and Fuel Use Calculation Methods
Potrero Power Station Mixed-Use Development Project
San Francisco, California

Type	Source	Methodology and Formula	Reference
Construction Equipment	Diesel Off-Road Equipment[1]	$Fc = \Sigma(FFc * HP * LF * Hr * C)$	OFFROAD2011 and ARB/USEPA Engine Standards
	Electric Off-Road Equipment	Estimated based on Event Center and Mixed-Use Development at Mission Bay Blocks 29-32 Draft Subsequent EIR	--
	Water Usage[2]	$E_W = \Sigma(AR * A * EI)$	CalEEMod 2016.3.2
	Harbor Craft (barges and tugs)[3]	$F_b = FF_0 * F * (1+D*A/UL) * HP * LF * Hr$	ARB Commercial Harborcraft (CHC) Inventory
Construction On-Road Mobile Sources[4]	Exhaust – Running	$F_R = \Sigma(VMT * C / FF_R)$, where VMT = Trip Length * Trip Number	EMFAC2014
Operational Generator Emissions[5]	Stationary Source	$F_{SS} = FF_{SS} * HP * LF * Hr * C$	--
Operational Wastewater Treatment[6]	Stationary Source	$E_{WW} = (EI_S + EI_T + EI_D) * (W_I + W_O) + EI_{T,W} * W_I$	CalEEMod 2016.3.2
Operational On-Road Mobile Sources	Exhaust - Running	Estimated using CalEEMod, see User's Guide.	CalEEMod 2016.3.2
Operational Transportation Refrigeration Unit[7]	TRU Engine Exhaust	$E_t = \Sigma(EF_t * HP * LF * Hr)$	OFFROAD 2007 and OFFROAD2017
Operational Area Sources[8]	Area sources including architectural coating, hearths, landscaping equipment, consumer products, and building energy use.	Various CalEEMod Methods, see User's Guide.	CalEEMod 2016.3.2

Notes:

1. F_c: off-road equipment diesel fuel use (gal).
   FFc: fuel use factor (gal/hp-hr) based on SCAQMD CEQA Air Quality Handbook, Table A9-3E
   HP: equipment horsepower, OFFROAD2011
   LF: equipment load factor, OFFROAD2011
   Hr: equipment hours
   C: unit conversion factor
2. E_w: Construction water energy use (kWh)
   AR: Water application rate (gal/acre/day), CalEEMod
   A: Acres disturbed per day per equipment, CalEEMod
   EI: BAAQMD energy intensity for supply, distribution, and treatment of water, CalEEMod® default
3. F_b: harbor craft fuel use (gal)
   FF_o: fuel use factor (gal/hp-hr) based on SCAQMD CEQA Air Quality Handbook, Table A9-3E
   F: fuel correction factor from the CHC Inventory
   D: engine deterioration factor from the CHC Inventory
   A: engine age provided by the construction contractor
   UL: engine useful life from the CHC Inventory
   HP: equipment horsepower provided by the construction contractor
   LF: equipment load factor from the CHC Inventory
   Hr: hours of operation per day provided by the construction contractor

Table 3: Energy and Fuel Use Calculation Methods
Potrero Power Station Mixed-Use Development Project
San Francisco, California

4. On-road mobile sources include truck and passenger vehicle trips. Emissions associated with mobile sources were calculated using the following formulas.

F_R: Vehicle Fuel use (gal).

FF_R: Fleet average fuel economy (mile/gal). From EMFAC2014.

VMT: vehicle miles traveled

C: unit conversion factor

The calculation involves the following assumptions:

a. All material transporting and soil hauling trucks are heavy-heavy duty trucks.

b. Trip Length: The one-way trip length as calculated based on the truck route or the default length from CalEEMod or construction contractor.

c. Trip Number: provided by the construction contractor or estimated in CalEEMod.

5. Operational emissions from the generator were calculated using the following formulas:

F_{SS}: Stationary Source Fuel Use (gal).

FF_{SS}: Stationary Source fuel use factor (gal/hp-hr) based on SCAQMD CEQA Air Quality Handbook, Table A9-3E

HP: equipment horsepower

Hr: hours of operation per year (hr)

LF: equipment load factor

C: unit conversion factor

6. Wastewater treatment energy use was calculated according to the following formulas:

E_{WW}: Wastewater energy use (kWh)

W_I: Indoor water usage (Mgal) estimated from CalEEMod.

W_O: Outdoor water usage (Mgal) estimated from CalEEMod.

EI_S: Energy Intensity Required to Supply Water (kWh/Mgal)

EI_T: Energy Intensity Required to Treat Water (kWh/Mgal)

EI_D: Energy Intensity Required to Distribute Water (kWh/Mgal)

$EI_{T,W}$: Energy Intensity Required to Treat Wastewater (kWh/Mgal)

5. E_t: TRU GHG Emissions (g CO2e).

EF_t: GHG Emission factor (g/hp-hr) from ARB OFFROAD2017 model for TRU

HP: equipment load factor from the CARB TRU inventory

LF: equipment load factor from the CARB TRU inventory

Hr: equipment running hours, including travel and unloading time where travel hours = trip length/travel speed, trip length from CalEEMod default, travel speed = 10 miles/hour, unloading time is based on average delivery time of 27 minutes from McCormack et al. (2010) "Truck Trip Generation by Grocery Stores", prepared by University of Washington.

7. Emissions for the various area sources were calculated using CalEEMod®.

Abbreviations:

ARB: California Air Resources Board
CHC: Commercial Harborcraft
FF: fuel use factor
EMFAC: EMission FACtor Model
g: gram
gal: gallon
HP: horsepower
lb: pound
LF: load factor
mi: mile
USEPA: United States Environmental Protection Agency
VMT: vehicle miles traveled

References:

ARB (2007). Emissions Estimation Methodology for Commercial Harbor Craft Operating in California. Available online at: https://www.arb.ca.gov/regact/2010/chc10/appc.pdf

ARB/USEPA. 2013. Table 1: ARB and USEPA Off-Road Compression-Ignition (Diesel) Engine Standards. Available online at: http://www.arb.ca.gov/msprog/ordiesel/documents/Off-Road_Diesel_Stds.xls

ARB. 2014. EMission FACtors Model, 2014 (EMFAC2014). Available online at: http://www.arb.ca.gov/emfac/2014/

CalEEMod® 2016.3.2. Available Online at: http://www.caleemod.com

Event Center and Mixed-Use Development at Mission Bay Blocks 29-32 Draft Subsequent EIR, Analysis of Energy Use Associated with the Proposed Golden State Warriors Project. Available at: http://www.gsweventcenter.com/GSW_RTC_References/2015_1019_Ramboll_Environ.pdf

McCormack et al. (2010). "Truck Trip Generation by Grocery Stores", prepared by University of Washington for Transportation Northwest (TransNow) and Washington State Department of Transportation. Available online at: http://www.wsdot.wa.gov/NR/rdonlyres/E7164661-25E6-421B-B828-C2EF5F909180/0/TruckTripGenerationGroceryStoresreportAugust2010.pdf

Table 4: CO2e Intensity Factor Derivation, PGE
Potrero Power Station Mixed-Use Development Project
San Francisco, California

	2014[1,2]	2015[1,3]	2016[1,4]	Average[5]	Units
CO_2 Intensity Factor per Total Energy Delivered	435	405	294	378	lbs CO_2/MWh delivered
% of Total Energy From Renewables	27%	29.5%	32.8%	30%	
CO_2 Intensity Factor for Total Non-Renewable Energy[6]	596	574	437	538	lbs CO_2/MWh delivered
Estimated Intensity Factor for Total Energy Delivered[7,8]					
2020 RPS (33%)[9]				360	lbs CO_2/MWh delivered
				363	lbs CO_2e/MWh delivered
2030 RPS (50%)[10]				269	lbs CO_2/MWh delivered
				271	lbs CO_2e/MWh delivered
2050 RPS (80%)[11]				108	lbs CO_2/MWh delivered
				110	lbs CO_2e/MWh delivered

Notes:

[1] Total CO_2 emission factor from The Climate Registry. Available at: https://www.theclimateregistry.org/our-members/cris-public-reports/. Accessed: December, 2017.

[2] Percent of total energy from eligible renewables is from the PGE 2015 Corporate Responsibility Report. Available at: http://www.pgecorp.com/corp_responsibility/reports/2015/PGE_CRSR_2015.pdf.

[3] Percent of total energy from eligible renewables is from the PGE 2016 Corporate Responsibility Report. Available at: http://www.pgecorp.com/corp_responsibility/reports/2016/PGE_CRSR_Environment.pdf.

[4] Percent of total energy from eligible renewables is from the PGE 2017 Corporate Responsibility Report. Available at: http://www.pgecorp.com/corp_responsibility/reports/2017/assets/PGE_CRSR_2017.pdf

[5] This average uses the most recent three years of data.

[6] The emissions metric presented here is calculated based on the total CO_2 intensity factor divided by the percent of energy delivered from non-renewable sources.

[7] The intensity factor for total energy delivered is estimated by multiplying the percentage of energy delivered from non-renewable energy by the CO_2 emissions per total non-renewable energy metric calculated above. The estimate provided here and the energy reports issued by PGE assume that renewable energy sources do not result in any CO_2 emissions.

[8] Global Warming Potentials (GWP) are based on the IPCC Fourth Assessment Report. CH_4 and N_2O emission factors are from the CalEEMod® version 2016.3.2 defaults for PGE, and are conservatively assumed not to change from these estimates. As more renewable energy is integrated into the electricity grid, these intensity factors will also decrease.

[9] Emission factor presented here is 33% projected RPS in 2020, consistent with SB350. Available at: http://www.energy.ca.gov/portfolio/.

[10] Emission factor presented here is 50% projected RPS for 2030 consistent with SB 32 and SB 350, as set forth by Executive Order S-14-08 and SB X1-2. Available at: http://www.energy.ca.gov/sb350/.

[11] Electricity load to reach 80% renewable in 2050, consistent with the Final CARB 2017 Scoping Plan Update, Appendix D PATHWAYS, pg 12 (November, 2017). Available at: https://www.arb.ca.gov/cc/scopingplan/2030sp_appd_pathways_final.pdf

Abbreviations:

CARB - California Air Resources Board
CO_2 - carbon dioxide
CO_2e - carbon dioxide equivalent
GHG - greenhouse gases
IPCC - Intergovernmental Panel on Climate Change
lbs - pounds
MWh - megawatt-hour
RPS - Renewables Portfolio Standard
PGE - Pacific Gas & Electric
SB - Senate Bill
USEPA - US Environmental Protection Agency

Table 5. Electricity Intensity Factor Comparison
Potrero Power Station Mixed-Use Development Project
San Francisco, California

Phase[1]	Modeled Operation Year[1]	CO2e Intensity Factor (lbs CO2e/MWh delivered)		Ratio
		CalEEMod® Default[2]	Projected[3]	
1	2025	644	317	0.49
1 - 2	2026	644	308	0.48
1 - 3	2028	644	290	0.45
1 - 4	2031	644	263	0.41
1 - 5	2032	644	255	0.40
Build Out	2034	644	239	0.37

Notes:

[1] PPS Project will be built in several phases. As presented in Table 1, Phase 1 construction will be completed and start operating in year 2025. Subsequent interim phases (2, 3, 4, 5) will start operating in years 2026, 2028, 2031, and 2032, respectively. The full build out will start operating in 2034. To estimate the operation emissions, the year in which construction is completed for each Phase is modeled using CalEEMod®. This is conservative because emissions are likely to be lowered in subsequent years of operation due to cleaner vehicles and lowered carbon intensity of electricity generation.

[2] The CalEEMod® default electricity intensity factor is based on 2008 data. This was used in the CalEEMod® runs for the EIR.

[3] The projected CO2 intensity factor is derived based on a linear trajectory for electricity to reach RPS target (33% RPS in 2020, 50% RPS in 2030, and 80% RPS in 2050).

Abbreviations:

CO_2e - carbon dioxide equivalent

EIR - Environmental Impact Report

lbs - pounds

MWh - megawatt-hour

PGE - Pacific Gas & Electric

Table 6. Direct Wastewater GHG Emissions Calculation
Potrero Power Station Mixed-Use Development Project
San Francisco, California

Category	Phase 1	Phase 1 - 2	Phase 1 - 3	Phase 1 - 4	Phase 1 - 5	Build Out	Units
Modeled Year	2025	2026	2028	2031	2032	2034	--
Water Use (Mgal)[1]	108	215	418	562	785	858	Mgal/yr
Indoor Water	73	141	327	420	619	664	Mgal/yr
Outdoor Water	35	74	91	142	166	194	Mgal/yr
Indirect Emissions Associated with Water[2]							
Electricity to Supply Water	2,117	2,117	2,117	2,117	2,117	2,117	kWh/Mgal
Electricity to Treat Water	111	111	111	111	111	111	kWh/Mgal
Electricity to Distribute Water	1,272	1,272	1,272	1,272	1,272	1,272	kWh/Mgal
Electricity to Treat Wastewater	1,911	1,911	1,911	1,911	1,911	1,911	kWh/Mgal
CO2e Intensity Factor	317	308	290	263	255	239	lb CO_2e/MWh
Indirect Emissions from Phase	75	143	275	331	455	464	MT CO_2e/yr
Direct Emissions Associated with Wastewater[3]							
Septic Tank Emission Factor	5.9E-06	5.9E-06	5.9E-06	5.9E-06	5.9E-06	5.9E-06	MT CO_2e/gal
Aerobic Emission Factor	6.1E-07	6.1E-07	6.1E-07	6.1E-07	6.1E-07	6.1E-07	MT CO_2e/gal
Facultative Lagoon Emission Factor	9.7E-06	9.7E-06	9.7E-06	9.7E-06	9.7E-06	9.7E-06	MT CO_2e/gal
Direct Emissions from Phase	100	192	445	572	843	904	MT CO_2e/yr
Total Water Emissions from Phase	174	335	720	903	1,298	1,367	MT CO_2e/yr

Notes:

[1] Water use from CalEEMod output.

[2] Indirect emissions associated with water use are calculated using CalEEMod® default electricity usage factors for San Francisco County and electricity GHG intensity calculated in Table 5.

[3] Emissions are calculated based on the CalEEMod® default factors for San Francisco County. Direct emissions are based on a default split between septic tank, aerobic, and anaerobic wastewater treatment types (10.33%, 87.46%, and 2.21% respectively), as shown in CalEEMod® Appendix D Table 9.4. The gas produced by anaerobic digesters may be flared or sent to a cogeneration process; in this calculation, it is assumed all gas is flared or released as fugitive methane, as this is the default described in CalEEMod® Appendix A section 8.4.

Abbreviations:

CalEEMod® - CALifornia Emissions Estimator MODel
CO_2e - carbon dioxide equivalents
GHG - greenhouse gases
lb - pound
kWh - kilowatt-hour
Mgal - million gallons
MT - metric tonnes
MWh - megawatt-hour
yr - year

Table 7. Construction Energy Use and GHG Emission Factors
Potrero Power Station Mixed-Use Development Project
San Francisco, California

Construction Energy Use					
Project Activity	**Water Transportation (kwh)[1]**	**Electric Off-Road (kWh)[2]**	**Diesel Construction Off-Road (gallon)[3]**	**Diesel Construction On-Road (gallon)[4]**	**Gasoline Construction On-Road (gallon)[5]**
Phase 0	46,963	0	492,784	108,775	39,542
Phase 0.1	3,026	0	17,980	34,950	871
Phase 1	33,418	232,223	774,731	73,200	78,403
Phase 2	8,410	182,485	278,882	27,353	26,085
Phase 3	17,879	152,616	504,144	36,596	39,219
Phase 4	22,806	332,527	723,427	54,310	60,215
Phase 5	13,298	235,792	385,226	42,879	30,555
Phase 6	9,084	215,525	278,031	26,680	21,260

		GHG Emission Factor[6]			
Source	**Fuel**	**CO2**	**CH4**	**N2O**	**Unit**
Project Off-Road Construction Equipment[3]	Diesel	10.21	0.00057	0.00026	kg/gal
Project On-Road Construction Vehicles[4]	Diesel	74.1	0.76		g CO2e/MJ
Project On-Road Construction Trips[5]	Gasoline	72.89	1.05		g CO2e/MJ

Notes:

1. Water use during construction is estimated based on the acres disturbed per day calculated from CalEEMod® Appendix A and Appendix D Table 3.7 with an application rate of 3,020 gal/acre/day (AWMA 1992). Electricity use was then calculated based on the CalEEMod® default BAAQMD energy intensity of 0.005411 kWh per gallon for supply, distribution, and treatment of water. Year-by-year GHG emissions are calculated based on the electricity carbon intensity calculated in Table 10.
2. Electricity consumption for off-road construction equipment was scaled according to project building square footage from the Event Center and Mixed-Use Development at Mission Bay Blocks 29-32 Draft Subsequent EIR. Electric construction equipment are not expected to be used during the first two years of construction when site grading occurs since these equipment are primarily used only during building construction phases. Year-by-year GHG emissions are calculated based on the electricity carbon intensity calculated in Table 10.
3. Diesel fuel usage from off-road construction equipment is calculated using the construction equipment list provided by the Project Sponsor, equipment horsepower, the expected number of hours of use and a fuel usage rate of 0.05 gallons of diesel per horsepower (HP)-hour, based on SCAQMD CEQA Air Quality Handbook, Table A9-3E. Emission factors for off-road construction equipment are taken from the US EPA's Emission Factors for Greenhouse Gas Inventories, available at https://www.epa.gov/sites/production/files/2015-07/documents/emission-factors_2014.pdf.
4. Diesel fuel usage from on-road sources during construction was calculated from vendor and haul trips during each Phase. The fleet mix and fleet-average fuel efficiency for on-road vehicles operating during each sub-phase was obtained from EMFAC2014 for the starting year of each sub-phase. Diesel GHG emission factors for on-road sources are taken from the California ARB Low Carbon Fuel Standard GREET model simulation for the ultra-low sulfur diesel production pathway, available at https://www.arb.ca.gov/fuels/lcfs/121514ulsd.pdf. The heating value for diesel fuel is assumed to be 127,500 BTU/gallon (http://www.energy.ca.gov/almanac/transportation_data/gge.html).

Table 7. Construction Energy Use and GHG Emission Factors
Potrero Power Station Mixed-Use Development Project
San Francisco, California

5. Gasoline fuel usage from on-road sources during construction was calculated from worker trips during each Phase. The fleet mix and fleet-average fuel efficiency for on-road vehicles operating during each sub-phase was obtained from EMFAC2014 for the starting year of each sub-phase. Gasoline GHG emission factors are taken from the California ARB Low Carbon Fuel Standard GREET model simulation for California Reformulated Gasoline Blendstock for Oxygenate Blending (CARBOB) production pathway, available at https://www.arb.ca.gov/fuels/lcfs/121514carbob.pdf. The heating value for gasoline fuel is assumed to be 111,800 BTU/gallon (http://www.energy.ca.gov/almanac/transportation_data/gge.html).
6. GHG emission factors are calculated on a CO2e basis assuming Global Warming Potentials (GWP) from the IPCC Fourth Assessment Report.

Abbreviations:

AWMA - Air & Waste Management Association
EMFAC - EMission FACtor Model
IPCC - Intergovernmental Panel on Climate Change
SCAQMD - South Coast Air Quality Management District

References:

Event Center and Mixed-Use Development at Mission Bay Blocks 29-32 Draft Subsequent EIR, Analysis of Energy Use Associated with the Proposed Golden State Warriors Project. Available at: http://www.gsweventcenter.com/GSW_RTC_References/2015_1019_Ramboll_Environ.pdf

Table 8. Operational Generator Fuel Use and GHG Emissions
Potrero Power Station Mixed-Use Development Project
San Francisco, California

Building Block	Phase	Fuel	Size (hp)	Fuel Consumption (gal/yr)[1]	GHG Emissions[2] (MT/yr)
1B	5	Diesel	1,006	1,624	17
5B	4	Diesel	1,341	2,666	27
6	4	Diesel	1,006	1,825	19
7B	2	Diesel	671	1,510	15
8	1	Diesel	671	1,598	16
14	5	Diesel	402	813	8
2	5	Diesel	2,682	10,076	103
3	3	Diesel	2,682	10,047	103
10	4	Diesel	1,006	1,815	19
11	2	Diesel	1,006	1,796	18
12	1	Diesel	1,006	1,780	18
9	1	Diesel	671	1,140	12
SPS	1	Diesel	161	402	4

Notes:

1. Diesel use from backup generators was calculated from the horsepower rating provided by the Project Sponsor, assuming 50 hours/year/generator (consistent with the Project EIR Air Quality analysis) and 0.05 gallons/horsepower-hour (consistent with construction equipment fuel use).

2. Emission factors for operational generators are taken from the US EPA's Emission Factors for Greenhouse Gas Inventories, available at https://www.epa.gov/sites/production/files/2015-07/documents/emission-factors_2014.pdf.

Abbreviations:

gal - gallon
hp - horsepower
MT - metric tonnes

Table 9. Greenhouse Gas Operational Unmitigated Emissions Summary

Potrero Power Station Mixed-Use Development Project

San Francisco, California

Phase	Modeled Operational year	GHG Emissions[1]								
		Area	Electricity[2]	Natural Gas	Mobile	TRU[3]	Generators	Waste	Water[3]	Total
		MT CO_2e/yr								
1	2025	25	1,599	1,102	4,042	0	50	430	174	7,422
1 - 2	2026	54	2,623	1,574	5,563	0	84	724	335	10,958
1 - 3	2028	54	3,418	2,181	6,247	0	187	839	720	13,646
1 - 4	2031	99	4,771	2,857	8,211	2.0	252	1,273	903	18,367
1 - 5	2032	126	5,553	3,584	9,438	2.0	380	1,508	1,298	21,888
Build Out	2034	171	5,818	3,954	10,467	2.0	380	1,803	1,367	23,963

Notes:

[1] GHG emissions are taken from the proposed Project CalEEMod® Outputs except for Generators and TRUs which are calculated using methods described in Table 3. Electricity and water emissions have been adjusted to reflect the projected PGE CO2e intensity factor for modeled operation year in CalEEMod. This derivation is shown in Tables 4 and 5. Construction emissions are shown separately in Table 7.

[2] Electricity usage is first taken from the Project CalEEMod outputs using CalEEMod defaults and scaled up by a ratio of 1.4 to reflect higher building electricity demand estimate by the Project sponsor for the full build out. The scaling factor of 1.4 is calculated using the build out electricity demand estimated by the Sponsor (53,632 kwh/year) divided by the CalEEMod estimates (39,092 kwh/year). GHG emissions related to building electricity use are calculated based on the electricity use and CO_2e intensity factor in Table 5.

[3] Based on the project description, Block 5 (Phase 4) is identified as a potential location for a grocery store. Therefore, TRU emissions associated with grocery operation will occur starting phase 4 operation. TRU emissions were calculated using the engine operating hours multiplied by the engine size, load factor, and GHG emission factors from California Air Resources Board OFFROAD2017 and OFFROAD2007 model. The emission factors are based on year 2031 (the first year of operation) and are conservative estimates for future years when TRU engines are expected to become more efficient. Operating hours were estimated based on the truck travel time plus unloading time; truck travel time is calculated as distance based on CalEEMod default value of 7.3 miles per one way trip for a Commercial-NonWork Trip, divided by the travel speed of 10 miles per hour, assuming 5 trucks per day. Loading time is based on average delivery time of 27 minutes from McCormack et al. (2010) "Truck Trip Generation by Grocery Stores", prepared by University of Washington. Emissions shown in this table are unmitigated and are therefore conservative; the Project proposes a mitigation option to plug in TRUs during unloading, which would reduce diesel combustion GHG emissions and is expected to offset any increase electricity GHG.

[4] Water GHG emissions include indirect emissions from the electricity needed to supply, treat, distribute water and treat wastewater as well as direct emissions from wastewater.

Abbreviations:

AB900 - Assembly Bill 900

CalEEMod® - CALifornia Emissions Estimator MODel

CO_2e - carbon dioxide equivalents

GHG - greenhouse gases

kwh - kilowatt-hour

MT - metric tonnes

yr - year

References:

CalEEMod® 2016.3.2. Available Online at: http://www.caleemod.com

McCormack et al. (2010). "Truck Trip Generation by Grocery Stores", prepared by University of Washington for Transportation Northwest (TransNow) and Washington State Department of Transportation. Available online at: http://www.wsdot.wa.gov/NR/rdonlyres/E7164661-25E6-421B-B828-C2EF5F909180/0/TruckTripGenerationGroceryStoresreportAugust2010.pdf

Table 10. Project CO2e Emissions by Year
Potrero Power Station Mixed-Use Development Project
San Francisco, California

Year	CO2e Intensity Factor (lb CO2e/MWh)[1]	Fleet CO2e EF (g/mi)[2]	% change in carbon intensity from previous year	% change in Fleet EF from previous year	GHG Emissions (MT CO2e/yr)														
					Operation[3]									Construction					
						Energy					Water								
					Area	Electricity	Natural Gas	Mobile	TRU[4]	Waste	Treatment	Transportation	Generators[5]	Water Transportation[6]	Diesel Off-Road[7]	Diesel On-Road[7]	Gasoline On-Road[8]	Electric Off-Road[9]	Total
2020	**363**	404	--	--	0	0	0	0	0	0	0	0	0	2.6	1,699	367	115	0	2,183
2021	354	392	-2.5%	-2.9%	0	0	0	0	0	0	0	0	0	2.5	1,692	365	115	0	2,175
2022	345	380	-2.6%	-3.0%	0	0	0	0	0	0	0	0	0	3.3	3,023	487	229	6.1	3,748
2023	335	368	-2.7%	-3.2%	0	0	0	0	0	0	0	0	0	1.7	2,654	245	227	12	3,139
2024	326	357	-2.7%	-3.2%	0	0	0	0	0	0	0	0	0	2.6	4,095	717	335	23	5,173
2025	317	345	-2.8%	-3.2%	25	1,599	1,102	4,042	0	430	100	75	50	2.0	3,934	338	302	23	12,021
2026	308	335	-2.9%	-2.8%	54	2,623	1,574	5,563	0	724	192	143	84	0.83	1,792	137	123	9.3	13,021
2027	299	327	-3.0%	-2.6%	54	2,546	1,574	5,421	0	724	192	139	84	1.3	3,014	218	206	15	14,188
2028	290	319	-3.1%	-2.3%	54	3,418	2,181	6,247	0	839	445	275	187	1.1	2,657	192	182	14	16,693
2029	281	312	-3.2%	-2.2%	54	3,310	2,181	6,110	0	839	445	266	187	0.63	1,628	119	115	9.2	15,264
2030	**271**	307	-3.3%	-1.8%	54	3,202	2,181	6,003	0	839	445	257	187	1.5	3,719	338	254	25	17,507
2031	263	302	-3.0%	-1.5%	99	4,771	2,857	8,211	2.0	1,273	572	331	252	1.2	3,039	288	206	21	21,923
2032	255	298	-3.1%	-1.3%	126	5,553	3,584	9,438	2.0	1,508	843	455	380	0.61	1,598	165	106	12	23,770
2033	247	294	-3.2%	-1.2%	126	5,377	3,584	9,323	2.0	1,508	843	441	380	0	601	56	39	5.1	22,286
2034	239	291	-3.3%	-0.96%	171	5,818	3,954	10,467	2.0	1,803	904	464	380	0	451	42	29	3.7	24,489
2035	231	289	-3.4%	-0.80%	171	5,622	3,954	10,383	2.0	1,803	904	448	380	0	0	0	0	0	23,667
2036	223	287	-3.5%	-0.61%	171	5,426	3,954	10,320	2.0	1,803	904	432	380	0	0	0	0	0	23,392
2037	215	286	-3.6%	-0.48%	171	5,230	3,954	10,270	2.0	1,803	904	417	380	0	0	0	0	0	23,130
2038	207	285	-3.8%	-0.40%	171	5,033	3,954	10,230	2.0	1,803	904	401	380	0	0	0	0	0	22,878
2039	199	284	-3.9%	-0.26%	171	4,837	3,954	10,203	2.0	1,803	904	385	380	0	0	0	0	0	22,639
2040	191	284	-4.1%	-0.17%	171	4,641	3,954	10,186	2.0	1,803	904	370	380	0	0	0	0	0	22,410
2041	183	283	-4.2%	-0.10%	171	4,445	3,954	10,176	2.0	1,803	904	354	380	0	0	0	0	0	22,188
2042	175	283	-4.4%	-0.039%	171	4,248	3,954	10,172	2.0	1,803	904	338	380	0	0	0	0	0	21,972
2043	167	283	-4.6%	0.0075%	171	4,052	3,954	10,172	2.0	1,803	904	323	380	0	0	0	0	0	21,761
2044	159	283	-4.8%	0.031%	171	3,856	3,954	10,176	2.0	1,803	904	307	380	0	0	0	0	0	21,553
2045	150	283	-5.1%	0.035%	171	3,660	3,954	10,179	2.0	1,803	904	292	380	0	0	0	0	0	21,344
2046	142	284	-5.4%	0.050%	171	3,464	3,954	10,184	2.0	1,803	904	276	380	0	0	0	0	0	21,138
2047	134	284	-5.7%	0.080%	171	3,267	3,954	10,192	2.0	1,803	904	260	380	0	0	0	0	0	20,934
2048	126	284	-6.0%	0.12%	171	3,071	3,954	10,204	2.0	1,803	904	245	380	0	0	0	0	0	20,734
2049	118	285	-6.4%	0.13%	171	2,875	3,954	10,218	2.0	1,803	904	229	380	0	0	0	0	0	20,536
2050	**110**	285	-6.8%	0.15%	171	2,679	3,954	10,233	2.0	1,803	904	213	380	0	0	0	0	0	20,339

Notes:

[1] Uses a linear interpretation between the electricity intensity factors derived in Table 4 (values in bold).

[2] Approximation of the decrease in vehicle emission factors over time, based on San Francisco fleet-average emission factors from 2023-2050. Assumes no change after 2050, since EMFAC2014 does not project past 2050.

[3] Operational GHG emissions are based on the CalEEMod outputs for various modeled years corresponding to the starting operational year for each phase (Phase 1 - 2025; Phases 1 to 2 - 2026; Phases 1 to 3 - 2028; Phases 1 to 4 - 2031; Phases 1 to 5 - 2032) and build out year (Phases 1 to 6 - 2034). For interim years in between the modeled years, operational GHG emissions from area sources, natural gas use, waste, and generators were assumed to be the same as those in the start year of each overlapping phase because the emission factor does not vary by year. However, operational GHG emissions related to electricity use and mobile sources are adjusted using % reduction in carbon intensity (for electricity) or in fleet-average emission factors (for mobile sources) due to lower emission factors into the future years. Operational building electricity consumption is scaled up from the CalEEMod output by a ratio of 1.4 to reflect higher building electricity demand estimated by the Project sponsor for the full build out. The scaling factor of 1.4 is calculated using the build out electricity demand estimated by the Sponsor (53,632 kwh/year) divided by the CalEEMod estimates (39,092 kwh/year).

[4] Based on the project description, Block 5 (Phase 4) is identified as a potential location for a grocery store. Therefore, TRU emissions assocciated with grocery operation will occur starting phase 4 operation. TRU emissions were calculated using the engine operating hours multiplied by the engine size, load factor, and GHG emission factors from California Air Resources Board OFFROAD2017 and OFFROAD2007 model. The emission factors are based on year 2031 (the first year of operaiton) and are conservative estimates for future years when TRU engines are expected to become more efficient.

[5] Diesel use from backup generators was calculated from the horsepower rating provided by the Project Sponsor, assuming 50 hours/year/generator (consistent with the Project EIR Air Quality analysis) and 0.05 gallons/horsepower-hour (consistent with construction equipment fuel use). A total of 15 generators are assumed to be operational.

[6] Water use during construction is estimated based on the acres disturbed per day calculated from CalEEMod® Appendix A and Appendix D Table 3.7 with an application rate of 3,020 gal/acre/day (AWMA 1992). Electricity use was then calculated based on the CalEEMod® default BAAQMD energy intensity of 0.005411 kWh per gallon for supply, distribution, and treatment of water.

[7] Diesel GHG emission factors for on-road sources are taken from the California ARB Low Carbon Fuel Standard GREET model simulation for the ultra-low sulfur diesel production pathway, available at https://www.arb.ca.gov/fuels/lcfs/121514ulsd.pdf. Emission factors for off-road construction equipment are taken from the US EPA's Emission Factors for Greenhouse Gas Inventories, available at https://www.epa.gov/sites/production/files/2015-07/documents/emission-factors_2014.pdf. The heating value for diesel fuel is assumed to be 127,500 BTU/gallon (http://www.energy.ca.gov/almanac/transportation_data/gge.html).

[8] Gasoline GHG emission factors are taken from the California ARB Low Carbon Fuel Standard GREET model simulation for California Reformulated Gasoline Blendstock for Oxygenate Blending (CARBOB) production pathway, available at https://www.arb.ca.gov/fuels/lcfs/121514carbob.pdf. The heating value for gasoline fuel is assumed to be 111,800 BTU/gallon (http://www.energy.ca.gov/almanac/transportation_data/gge.html).

[9] Electricity consumption for off-road construction equipment was scaled according to project building square footage from the Event Center and Mixed-Use Development at Mission Bay Blocks 29-32 Draft Subsequent EIR. Electric construction equipment are not expected to be used in the first two years of construction when site grading occurs since these equipment are primarily used only during building construction phases.

Abbreviations:

AB - Assembly Bill
CARB - California Air Resources Board
CO_2e - carbon dioxide equivalent
EMFAC - CARB Emissions Factor model
g - gram
lb - pound
mi - mile
MWh - megawatt-hour
MT - metric ton
RPS - Renewables Portfolio Standard

Table 11. Power Generation and Carbon Intensity of Potrero Power Plant (2001-2010)
Potrero Power Station Mixed-Use Development Project
San Francisco, California

Year	Natural Gas Fuel Consumption (MMBTU)[1]	Net Electricity Generation (MWh)	Electricity Energy Intensity (MMBTU/MWh)	CO_2e intensity (lb CO_2e/MWh)[2]
2001	11,091,583	1,135,034	9.77	1,145
2002	5,866,154	545,068	10.76	1,261
2003	8,580,864	824,960	10.40	1,219
2004	8,821,473	844,596	10.44	1,224
2005	4,159,731	385,621	10.79	1,264
2006	5,785,271	521,444	11.09	1,300
2007	5,371,294	474,719	11.31	1,326
2008	5,863,876	530,220	11.06	1,296
2009	7,011,187	641,668	10.93	1,280
2010	4,702,073	431,813	10.89	1,276
			Average	1,259

Notes:

[1] Data from Form EIA-923 detailed data for 2010 (https://www.eia.gov/electricity/data/eia923/)

[2] The carbon intensity of natural gas combustion is assumed to be 117 lb CO_2/MMBTU, based on data from US EPA (2014), "Emission Factors for Greenhouse Gas Inventories". Available at: https://www.epa.gov/sites/production/files/2015-07/documents/emission-factors_2014.pdf. Additionally, CalEEMod® version 2016.3.2 default emission factors for CH_4 and N_2O for PGE were added on a lb CO_2e/MWh basis assuming Global Warming Potentials (GWP) from the IPCC Fourth Assessment Report.

Abbreviations:

CO_2e - carbon dioxide equivalent
EIA - U.S. Energy Information Admistration
lb - pound
MMBTU - Million British Thermal Units
MWh - megawatt-hour

Table 12. Comparison of GHG Emissions between PPP and PG&E
Potrero Power Station Mixed-Use Development Project
San Francisco, California

	CO_2 Intensity (lb CO_2e/MWh)
PPP (2001-2010 average)	1,259
PG&E (2011-2015 average)[1]	423
Difference in GHG Intensity	836

	Low	High
Range of PPP Electricity Generation over 2001-2010 (MWh/year)	385,621	1,135,034
GHG Avoided (MT CO_2e/year)[2]	146,226	430,401

Notes:

[1] Data obtained from The Climate Registry CRIS Public Reports (https://www.theclimateregistry.org/our-members/cris-public-reports/). CalEEMod® version 2016.3.2 default emission factors for CH4 and N2O for PGE were added on a lb CO2e/MWh basis assuming Global Warming Potentials (GWP) from the IPCC Fourth Assessment Report.

[2] CO_2 avoided is calculated as the minimum/maximum electricity generated annually by PPP over 2001-2010 multiplied by the difference in CO_2 intensity between PPP and PG&E.