ENVIRONMENTAL ASSESSMENT FOR THE SOLAR PHOTOVOLTAIC SYSTEM PROJECT AT THE SAN FRANCISCO VETERANS AFFAIRS MEDICAL CENTER, CALIFORNIA

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LIST OF ACRONYMS AND ABBREVIATIONS

APCD	Air Pollution Control District
AQMD	Air Quality Management Districts
BAAQMD	Bay Area Air Quality Management District
BMP	best-management practice
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
Cal/EPA	California Environmental Protection Agency
CARB	California Air Resources Board
CEQ	Council on Environmental Quality
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
CH_4	methane
CHP	combined heat and power
CO	carbon monoxide
CO_2	carbon dioxide
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
EA	Environmental Assessment
EIS	Environmental Impact Statement
EISA	Energy Independence & Security Act
EO	Executive Order
EPAct	Energy Policy Act
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FONSI	Finding of No Significant Impact
FY	fiscal year
GGNRA	Golden Gate National Recreation Area
GHG	greenhouse gas(ses)
HAP	hazardous air pollutant(s)
IICEP	Interagency and Intergovernmental Coordination for Environmental Planning
LOS	level-of-service
MBTA	Migratory Bird Treaty Act
MWh	megawatt hour(s)
mt	metric tons(s)

NAAQS	National Ambient Air Quality Standards
NDMS	National Disaster Medical System
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NO_X	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
O_3	ozone
OWPCP	Oceanside Water Pollution Control Plant
Pb	lead
PG&E	Pacific Gas & Electric
PM	particulate matter
$PM_{2.5}$	particulate matter equal to or less than 2.5 microns in diameter
PM_{10}	particulate matter equal to or less than ten microns in diameter
PURPA	Public Utility Regulatory Policies Act
PV	photovoltaic
RCRA	Resource Conservation and Recovery Act
ROG	reactive organic gas(ses)
RWQCB	Regional Water Quality Control Board
SFBAAB	San Francisco Bay Area Air Basin
SFPUC	San Francisco Public Utilities Commission
SFVAMC	San Francisco Veterans Affairs Medical Center
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SO_2	sulfur dioxide
SWRCB	California State Water Resources Control Board
TAC	toxic air contaminants(s)
tpy	tons per year
UCSF	University of California, San Francisco
USEPA	US Environmental Protection Agency
USFWS	US Fish and Wildlife Service
VA	US Department of Veterans Affairs
VMU	Veterinary Medical Unit

SECTION 1.0
PROPOSED ACTION

The United States Department of Veterans Affairs' (VA's) National Energy Business Center proposes to install a solar photovoltaic (PV) system at its medical center in San Francisco, California to expand the use of renewable energy within the facility.

The San Francisco VA Medical Center (SFVAMC) is located at 4150 Clement Street, near the northwestern tip of the San Francisco peninsula, within the 29-acre Fort Miley campus, abutting the Golden Gate National Recreation Area (GGNRA) to the north, west, and east (Figure 1-1). The SFVAMC campus (Figure 1-2) was originally developed in 1934, but has been modified and expanded several times since. SFVAMC currently operates 124 hospital beds, as well as a 120-bed community living center. The SFVAMC provides regional referral service for specialized surgical and medical procedures, is affiliated with the University of California, San Francisco (UCSF), and has the largest funded research program in the VA Health Administration.

Located in northwestern San Francisco, the 29-acre San Francisco VA Medical Center operates 124 hospital beds, a 120-bed community living center, and has the largest funded research program in the VA Health Administration.

1.1 NEED FOR THE PROPOSED ACTION

In 2003, the VA established an agency-wide program intended to increase energy efficiency and reduce the emission of greenhouse gasses (GHGs) at its facilities. Program goals included reducing energy consumption and expanding the use of renewable energy at VA facilities (VA 2003). Implementing the goals of the VA program would promulgate the requirements of Executive Order (EO) 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*, which requires Federal agencies to reduce GHG emissions through myriad energy consumption reduction and conservation directives. At the SFVAMC, electricity is presently purchased from an off-site supplier, and the use of renewable energy has not been integrated into the campus electricity supply system.

The *need* for the Proposed Action at the SFVAMC is to transition the existing traditional electricity supply system to a system based more on renewable energy and that reduces energy consumption. The goal of the SFVAMC is to optimize the usage of solar PV systems throughout the campus. Project implementation would reduce energy consumption through the incorporation of renewable electricity generation systems at the SFVAMC while achieving compliance with energy efficiency and GHG reduction goals established by the VA and EO 13514. Further, the project would reduce facility operating costs through increased use of self-sustaining, on-site renewable electricity generation systems.

EA

Regional Location
San Francisco VA Medical Center

FIGURE 1-1

1.2 PURPOSE OF THE PROPOSED ACTION

The *purpose* of the Proposed Action is to install a solar PV system at the SFVAMC that:

1) increases energy efficiency through the use of an on-site renewable electricity generation system;
2) reduces energy consumption costs and decreases reliance upon off-site electricity supplies; and
3) contributes toward the achievement of energy efficiency and GHG reduction goals established by the VA and EO 13514.

1.3 SOLAR PHOTOVOLTAIC SYSTEM

Solar PV technology uses semiconductor material to convert light energy from the sun into electrical energy. Commonly known as *solar cells*, individual PV cells are often connected together to form PV *modules* that may be up to several feet long and several feet wide. In turn, modules can be combined and connected to form PV *arrays* of different sizes and power output.

Example solar PV array rooftop system. *Installation of rooftop systems may require the construction of additional structural mounting or other support systems.*

The size of an array depends on factors such as the amount of sunlight available in a particular location and the needs of the consumer. The modules of an array make up the major part of a PV *system*, which can also include electrical connections, mounting hardware, power-conditioning equipment, and batteries that store solar energy for use when sunlight is not directly accessible.

Solar PV systems can be installed at a number of locations, including on rooftops, in parking lot areas, and in undeveloped open space. On flat rooftops, PV systems can be mounted directly onto the rooftop material (typically known as *ballast*), while pitched rooftops often require the construction of additional structural support. In parking areas, PV systems are typically mounted on existing or newly constructed carport structures; these systems can also be installed on the rooftops of parking structures. Additional installation options for solar PV systems include installation of surface- and/or structure-mounted systems in undeveloped and open space areas.

Example solar PV array carport system. *Such systems may be installed in parking areas or on top of parking structures.*

1.4 CONSTRUCTION

Construction processes required to install solar PV systems varies depending upon the location of the system (e.g., rooftop, parking area, etc.), and by the presence and condition of existing infrastructure (e.g.,

utility connections, physical structures for mounting, etc.) that can be incorporated into the system. Components of solar PV system construction may include:

- Modification to existing physical infrastructure (e.g., rooftops and other potential support structures) to adequately accommodate system installation;
- Site preparation (e.g., grading, leveling, trenching for underground utility connections, etc.);
- Shipping and delivery of mounting structures, solar PV cells, and supporting hardware;
- Installation of mounting structures and solar PV cells; and
- Installation and connection of utility cables to electrical switching equipment at a main facility.

Installation of solar PV systems on existing support structures such as rooftops can reduce the complexity and cost of construction. However, structural modifications may be required prior to system installation, thereby resulting in increased design complexity and potential logistical challenges. In contrast, establishment of solar PV systems on new infrastructure would not entail potentially complex structural modifications, but may present additional cost and logistical challenges due to spatial and environmental constraints that result from the establishment of new infrastructure.

1.5 OPERATIONAL CHARACTERISTICS OF A SOLAR PHOTOVOLTAIC SYSTEM

Solar PV systems produce energy in the form of *direct current* electricity that either powers site-specific batteries or equipment, or is fed into an electrical distribution system. Feeding solar PV system electricity into a distribution system requires utility cable connections that link the system to switching and transformer equipment which in turn convert the electricity into *alternating current* and appropriate voltage for consumption (Figure 1-2).

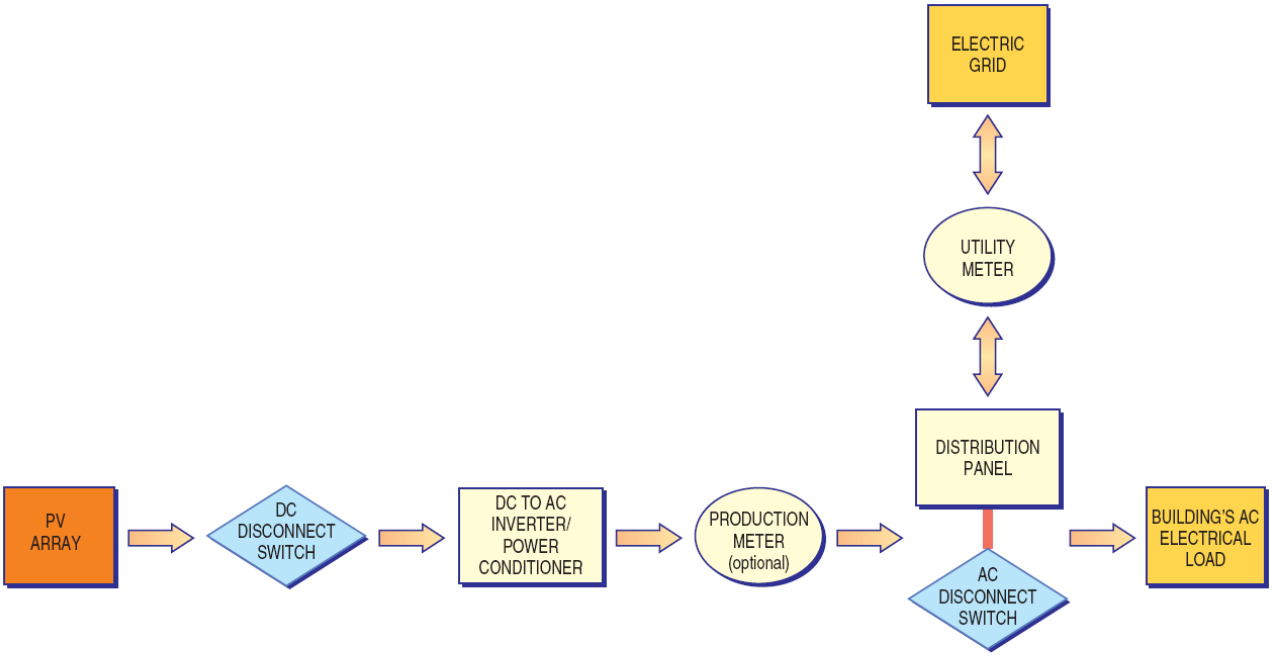


Figure 1-2 Solar Photovoltaic Power System

Establishment of solar PV systems results in reduced consumption of energy from traditional electrical grid sources, and cost savings typically offset system installation costs after a certain period of time (known as the *return on investment* period). Decreased reliance upon traditional electrical grid sources also presents a potential security advantage by increasing energy independence. The amount of energy produced by a system can be maximized by installing the system in a location with ample solar radiation and minimal shading. Solar PV systems generally require very low maintenance, including routine inspections and periodic rinsing of the PV system to remove accumulated dust and debris. The operational lifespan of the solar arrays that comprise PV systems is typically between 20 and 25 years, and replacement of individual arrays can occur on a rotational basis to avoid service disruptions.

1.6 ENVIRONMENTAL ASSESSMENT PROCESS

The primary legislation affecting the VA's environmental assessment and decision-making process is the National Environmental Policy Act (NEPA) of 1969. In accordance with NEPA, Federal agencies are required to take into consideration potential environmental consequences of proposed actions in their decision-making processes. The intent of NEPA is to protect, restore, or enhance the environment through well-informed Federal decisions. The Council on Environmental Quality (CEQ) was established under NEPA to implement and oversee Federal policy in this process.

The CEQ subsequently issued *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act* (40 Code of Federal Regulations [CFR] §§ 1500-1508). These regulations specify that an *Environmental Assessment* (EA) be prepared to:

- briefly provide sufficient analysis and evidence for determining whether to prepare an *Environmental Impact Statement* (EIS) or a *Finding of No Significant Impact* (FONSI);
- aid in an agency's compliance with NEPA when no EIS is necessary; and
- facilitate preparation of an EIS when one is necessary.

CEQ regulations consider the human environment to include the natural and physical environment and the relationship of people with that environment. Economic or social effects, however, are not intended by themselves to require preparation of an EIS (40 CFR § 1508.14).

This EA identifies, documents, and evaluates the effects of the No-Action Alternative and the Proposed Action on existing resources at and around the SFVAMC. Section 3, *Affected Environment*, presents baseline information on resources potentially impacted by implementation of the No-Action Alternative or the Proposed Action, including:

- Aesthetics
- Air Quality
- Community Services and Utilities
- Cultural and Historical Resources
- Floodplains, Wetlands, Watersheds, Rivers, Lakes, and Coastal Zone
- Geology and Soils
- Hydrology and Water Quality
- Land Use

- Noise
- Socioeconomics
- Solid/Hazardous Waste
- Transportation and Parking
- Vegetation and Wildlife

Potential environmental impacts of the No-Action Alternative and the Proposed Action are described in Section 4, *Environmental Consequences*. This analysis includes *direct* impacts (those caused by an action and occurring at the same time and location) and *indirect* impacts (those caused by an action but occurring later or in a physically disconnected location, but within a reasonably foreseeable time or geographic area). Discussion will include best-management practices (BMPs) that could be employed to further reduce adverse effects upon the environment; these BMPs can be employed whether or not significant impacts are identified. Descriptions of BMPs will appear following each action's resource discussions, as applicable. Chapter 5, *Cumulative Impacts*, describes potential impacts of each action when cumulatively considered in the context of other past, present, and reasonably foreseeable future actions at the SFVAMC and the general vicinity, regardless of whether such actions are Federal or non-Federal.

1.7 PUBLIC INVOLVEMENT AND AGENCY COORDINATION

CEQ regulations require the incorporation of public involvement and agency coordination as part of the NEPA process (40 CFR § 1501.4[b]). Known as *Interagency and Intergovernmental Coordination for Environmental Planning* (IICEP), this federally mandated process includes informing and coordinating with other governmental agencies regarding proposed actions that have potential environmental impacts, as well as releasing documents to the public for review and comment. Through the IICEP process, the VA will consider comments and concerns from the public and other governmental agencies and may subsequently incorporate such responses into the analysis of potential environmental impacts conducted as part of the EA and/or FONSI.

1.8 STATUTES AND REGULATIONS

Typical statutes, regulations, and Executive Orders (EOs) that guide VA project planning, development, and operations are listed below. These policies and guidelines are applicable to a variety of projects at all VA facilities and some may not apply to the actions proposed at the SFVAMC. Where relevant, Chapters 3 and 4 discuss specific laws, regulations, and permits that may affect the actions proposed at the facility, including:

- NEPA of 1969, as amended
- US Department of Veterans Affairs' *Environmental Compliance Manual*
- EO 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*, of 2009
- *Energy Policy Act* (EPAct) of 2005
- *Energy Independence & Security Act* (EISA) of 2007
- *Public Utility Regulatory Policies Act* (PURPA) of 1978
- *Clean Air Act* (CAA) of 1990, as amended

- *Clean Water Act* (CWA) of 1977, as amended
- *Endangered Species Act* (ESA) of 1973, as amended
- *Migratory Bird Treaty Act* (MBTA) of 1918, as amended
- *Resource Conservation and Recovery Act* (RCRA) of 1976, as amended
- EO 11990, *Protection of Wetlands*, of 1977
- *National Historic Preservation Act* (NHPA) of 1966, as amended
- *Coastal Zone Management Act* (CZMA) of 1972, as amended
- EO 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*, of 1994
- EO 13045, *Protection of Children from Environmental Health and Safety Risks*, of 1997
- *California Endangered Species Act* (CESA) of 1985, as amended

The VA would not implement the Proposed Action until after applicable regulatory agencies have been consulted and required permits have been obtained. Consultation and permitting with respect to the actions proposed at the SFVAMC may include coordination with the agencies listed below:

- Bay Area Air Quality Management District (BAAQMD) under the CAA
- California State Water Resources Control Board (SWRCB) under Section 401 of the CWA
- San Francisco Bay Regional Water Quality Control Board (RWQCB)
- US Fish and Wildlife Service (USFWS), under Section 7 of the ESA
- California State Historic Preservation Office (SHPO) under Section 106 of the NHPA
- US Environmental Protection Agency (USEPA), Region 9 (Pacific Southwest Region)
- California Environmental Protection Agency (Cal/EPA)

SECTION 2.0
ALTERNATIVES

2.1 DEVELOPMENT OF ALTERNATIVES

The development and selection of potential locations for solar PV system installation at the SFVAMC included an evaluation of existing rooftops and parking areas for sun exposure and shading, structural capability, ability to connect to the existing on-site electrical distribution system, the viability of the installed system in relation to facility master plans (e.g., for compatibility with future construction), and construction and operational costs. These criteria—which were used for determining feasible system installation locations in the January 2010 *Solar PV Feasibility Study for the SFVAMC* (VA 2010a)—are described below:

Sun Exposure and Shading. In the northern hemisphere, solar PV systems facing south have access to the highest solar incident radiation. However, shading from trees, buildings, and other physical structures at a given location can reduce the generating capacity of a system. South-facing solar PV system installation locations with minimal shading at the SFVAMC were selected to the extent feasible to maximize potential power generation.

Structural Capability. Existing rooftops at the SFVAMC were evaluated to determine capability to house a solar PV system based upon physical ability to support the system and the amount of structural modification (e.g., construction of structural mounting systems) needed for system installation. Locations with existing structural capability were selected to the extent feasible to minimize additional structural modification.

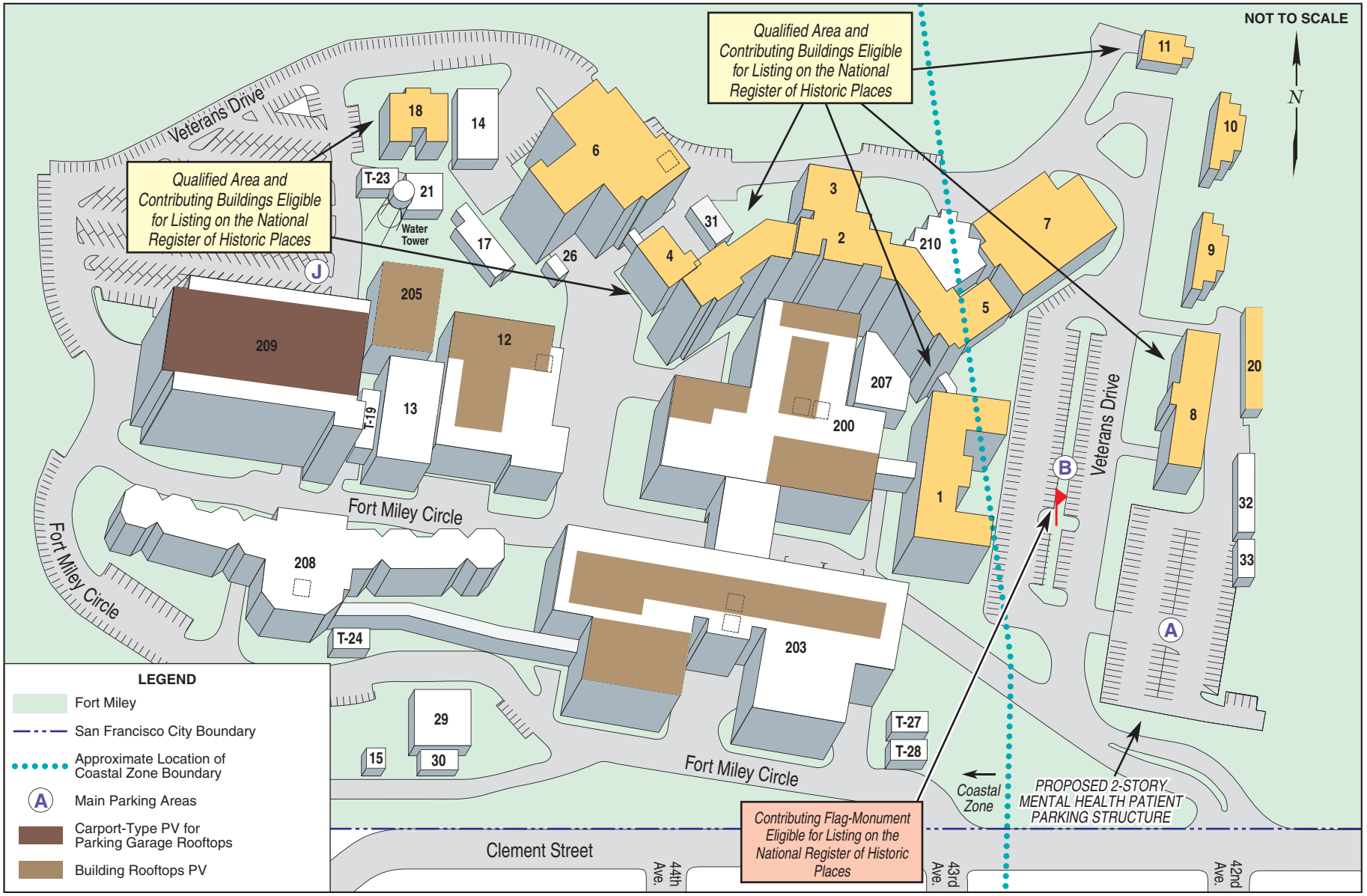
Distribution System Connection. Feasible solar PV system installation locations at the SFVAMC were evaluated for their ability to connect to the existing on-site electrical distribution system. Locations where distribution system connections did not require extensive instillation of new utility cables or other electrical equipment were selected in order to minimize construction costs and potential disturbance associated with the installation of new infrastructure.

Future System Viability. Potential solar PV system installation locations were evaluated in relation to planned future construction at the SFVAMC. Locations where future vertical building expansion or installation of other rooftop equipment would occur were precluded from further evaluation because of the potential for shading and potentially reduced productivity of installed systems.

Construction and Operational Costs. Evaluation of construction costs included both the actual cost of solar PV system mounting structures, cells, and supporting hardware, plus additional costs associated with electrical distribution system connections and potential structural modifications. Operational costs were evaluated based upon system energy output (e.g., the amount of energy generated from sun exposure at the installation site), routine maintenance costs, and future system replacement costs. Locations with prohibitive construction and operational costs were precluded from further evaluation.

2.2 DESCRIPTION OF THE ALTERNATIVES

This EA evaluates the two alternatives described below; additional alternatives eliminated from detailed consideration are discussed in Section 2.3:



EA

Proposed Project Site

FIGURE 2-1

2.2.1 Alternative 1: No-Action Alternative

In compliance with NEPA and CEQ regulations, the No-Action Alternative must be considered and associated potential impacts evaluated. Under this alternative, installation of a solar PV system would not occur at any location at the SFVAMC, and the facility's electricity demand from off-site supplies would remain unchanged. The purpose and need, as described in Sections 1.1 and 1.2, would not be met under implementation of the No-Action Alternative, meaning:

- Increased energy efficiency through the use of an on-site renewable electricity generation system would not occur;
- Reduced energy consumption costs and decreased reliance upon off-site electricity supplies would not occur; and
- Contributions toward the achievement of energy efficiency and GHG reduction goals established by the VA and EO 13514 would not be realized.

Although the No-Action Alternative does not meet the VA's purpose and need, the inclusion of this alternative is prescribed by CEQ regulations and will be carried forward for analysis in this EA. The No-Action Alternative also serves as a baseline against which the impacts of Alternative 2, the Proposed Action, can be evaluated.

2.2.2 Alternative 2 - Proposed Action

Five potential installation locations were selected at the SFVAMC, including four locations on existing rooftops and one location on an existing parking structure (VA 2010a and VA 2011). (Refer to Figure 2-1.) Each location is described below.

Building 12. Building 12 is a research building with a flat roof located in the central part of the SFVAMC. There is adequate space in the central section of the rooftop to facilitate installation of a solar PV system directly onto the rooftop ballast material. However, since the east section of the rooftop contains existing equipment, and portions of the south section are shaded by an adjacent building, installation on the *entire* rooftop of Building 12 was precluded from further evaluation. If installed, the solar PV system on Building 12 would be connected to existing electrical equipment in adjacent Building 205. Preliminary evaluations suggest that Building 12 is capable of supporting installation of the solar PV system without structural modification.

Building 200. Building 200, the Ambulatory Care Clinic, is a large flat-roofed structure located in the central part of the SFVAMC. Building 200 may be re-roofed in the next 2 to 3 years; however, such improvements are not currently funded. This analysis assumes that roof area would not substantially change with this possible improvement, and the site's solar PV feasibility would remain valid. There is adequate space in the northwest and southeast corners of the rooftop where a solar PV system could be installed directly onto the rooftop ballast material. Building 200 also contains a raised "penthouse" flat-roofed structure in the central section of the rooftop that could support installation of a solar PV system. However, portions of Building 200's rooftop were precluded from evaluation due to presence of existing equipment. The solar PV system on Building 200 would be connected to existing electrical equipment within the building or in adjacent Building 203. The roof of Building 200 is capable of supporting solar PV system installation without structural modification.

Building 203. Building 203, the Main Hospital Building, is a large flat-roofed structure located adjacent to Building 200. There is adequate space on the north and southwest sections of the building's rooftop

where a solar PV system could be installed directly onto the rooftop ballast material. However, the southeast section of the rooftop was precluded from evaluation due to presence of existing equipment. The solar PV system on Building 203 would be connected to existing electrical equipment within the building. The roof is comprised of a 3-inch concrete slab that is capable of supporting solar PV system installation without structural modification.

Building 205. Building 205 is an existing boiler plant with a flat roof located adjacent to Building 12. The rooftop of Building 205 contains some existing equipment; however, there is adequate space where a solar PV system could be installed directly onto the rooftop ballast material. The system would be connected to existing electrical equipment within the building. Building 205 has not been evaluated for structural integrity to support installation of a solar PV system.

Existing Parking Garage (Building 209). Building 209 is a four-level parking garage located in the western portion of the SFVAMC property. The uncovered upper level of the garage could support the installation of a solar PV system mounted on a newly constructed carport structure. The system would be connected to existing electrical equipment on the second level of the parking garage.

Construction. Under the Proposed Action, the timeline and logistics of installing each solar PV system would vary. Installation of systems at each location would generally last between two to four weeks depending on the size of the solar PV system that would be installed. Construction of additional components (e.g., carport structures, additional structural rooftop supports, electrical equipment connections, etc.) would likely extend the installation timeframe at some locations. In addition, if required by applicable development codes, select buildings may need to be seismically upgraded to support installation of solar PV systems on their rooftops. The anticipated construction footprint of each system installation would be limited to the installation sites and nearby staging areas, as required. Construction personnel at each site would average ten or fewer. Interruptions to existing electricity service to integrate the newly installed solar PV systems would be limited, and are not anticipated to last more than 24 hours. The actual timeframe for implementing each proposed solar PV system installation would depend on available funding, but would likely occur between FY 2011 and 2015 (VA 2010b).

Operations. Electricity generated from the newly installed solar PV systems would be seamlessly integrated into the SFVAMC electricity distribution system. If the Proposed Action is implemented fully, the combined annual electricity output of the systems would total approximately 1,292 megawatt hours (MWh), or about 6.1 percent of existing electricity usage at the SFVAMC[1] (VA 2010a, 2010c). Operation of the systems would require very low maintenance that would be limited to routine inspections and periodic rinsing of the PV system to remove accumulated dust and debris. The operational lifespan of the solar arrays that would comprise each PV system is anticipated to last at least 20 to 25 years, and individual arrays may be replaced as needed to extend each system's lifespan.

2.3 ALTERNATIVES ELIMINATED FROM DETAILED CONSIDERATION

Three additional solar PV system installation locations were considered in the planning process that led to development of the Proposed Action, but were eliminated from detailed consideration due to project requirements further described below.

Building 208. Building 208 is a pitched-roof community living center located in the south part of the SFVAMC. According to the *Feasibility Study*, the building has ample southern exposure that would

[1] Based upon 2008 electricity usage of 21,307 MWh (VA 2010c).

facilitate high solar incident radiation that would maximize potential power generation. Since Building 208 has a pitched roof, construction of additional structural support for the solar PV system would occur as part of installation. The availability of connections to existing electrical equipment to support system installation and use are not within close proximity and would need to be established. This system would have had the potential to produce an additional 70.4 MWh annual electricity output, or 0.3 percent of existing electricity usage at SFVAMC (VA 2010a, 2010c). Given the roof pitch and nearby site topography, with a moderately steep embankment intervening Building 208 and the nearest residences to the south and downslope, the solar arrays would not be visible from surrounding land uses immediately south of the project site, but may be partially visible from more distant residences, particularly multi-story buildings south of Building 208, in the Clement Street neighborhood of the Richmond District. To address concerns regarding construction constraints and potential neighborhood compatibility impacts, a rooftop solar PV array on Building 208 was eliminated from further consideration (VA 2011).

Proposed Parking Garage (Parking Lot A Footprint). A two-level parking garage is under construction within the existing footprint of Parking Lot A in the southeast portion of the SFVAMC campus. The uncovered upper level of the garage could support the installation of a solar PV system mounted on a newly constructed carport structure. Available connections to existing electrical equipment for system installation and use are not within close proximity and would need to be established. This system would have had the potential to produce an additional 280.2 MWh annual electricity output, or 1.3 percent of existing electricity usage at SFVAMC (VA 2010a, 2010c). This solar PV location was eliminated from detailed consideration due to its location in context with the *Historic District*, identified as such in the National Register of Historic Places (NRHP). Development of a carport-type support for the solar PV arrays would have introduced a new structure into this area within close proximity to the GGNRA. To reduce potentially significant effects upon the site's historic resources, reduce potential visual impacts from public viewing places within GGNRA, and to ensure compatibility with surrounding land use, this solar PV system installation location was eliminated from further consideration (VA 2011).

Parking Lot B. Located in the east part of the SFVAMC campus, Parking Lot B was determined to be capable of supporting installation of a solar PV system that would be mounted on a newly constructed carport structure (refer to Figure 2-1) (VA 2010a). The system would have produced an additional 359.1 MWh annual electricity output, or 1.7 percent of existing electricity usage at SFVAMC (VA 2010a, 2010c). However, this location was eliminated from detailed consideration due to the location of Parking Lot B within a *Historic District*, identified as such in the National Register of Historic Places (NRHP). The flagpole monument located in the center island of the parking lot has been designated as a *Contributing* structure to that *Historic District*, and development of a carport-type support for the solar PV arrays would have introduced a new structure into this open area—the gateway portion of the NRHP-listed district—and could have compromised the integrity of the flagpole-monument in context with this historical portion of the SFVAMC campus. To avoid potentially significant effects upon the site's historical resources, this solar PV system installation location was eliminated from further consideration (VA 2010b).

SECTION 3.0
AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This section describes baseline environmental conditions at the SFVAMC campus and, where applicable, the locations proposed for installation of solar PV systems. In compliance with NEPA and CEQ regulations, only those environmental conditions relevant to the Proposed Action are presented. Resources not addressed in detail in this section include *agricultural resources*, *mineral resources*, and *real property*. The Proposed Action would not result in development on any areas containing agricultural resources of statewide importance, and there are no known mineral resources located on any of the proposed solar PV system installation sites. Furthermore, the Proposed Action would not involve change in ownership, encroachment on critical areas, or changes of easements; therefore, real property is not addressed in this EA. Baseline data summarized in this section were compiled from existing documentation pertaining to the SFVAMC campus, previous environmental documents, consultation with facility personnel, and queries from resource-specific databases.

3.2 AESTHETICS

Aesthetics comprise the natural and human-created features that form the overall impression that an observer receives of an area, or its landscape character. Landforms, water surfaces, vegetation, and buildings are considered characteristic of an area if they are inherent to the structure and function of a landscape.

3.2.1 SFVAMC

The SFVAMC campus is located along a bluff overlooking the northwestern edge of San Francisco and the Pacific Ocean. The campus is situated at a higher elevation relative to areas in its immediate vicinity, and it is visible from nearby residential neighborhoods to the south and from the Golden Gate National Recreation Area and Pacific Ocean to the north, east, and west.

The SFVAMC campus is characterized by a visually prominent collection of one- to five-story buildings, with the original campus structures developed in 1934, designed in a "Mayan Deco" style, and reminiscent of the type, period, and method of VA hospitals built during the second quarter of the 1900s. Additional new construction and alterations to original structures have continued to occur throughout the facility's operation. Mature Monterey pine and Monterey cypress trees located within and adjacent to the SFVAMC campus are characteristic of the surrounding landscape. These trees and other vegetation partially screen views both on- and off-site.

SFVAMC's campus is characterized by a visually prominent collection of one- to five-story buildings, with original structures developed in 1934 in a "Mayan Deco" style.

The western part of the SFVAMC campus is characterized by various one- and two-story reinforced concrete structures (including Buildings 12 and 205), a water tower, a large surface parking area, and the existing four-level parking structure (Building 209). The Community Medical Facility (Building 208)

in the southwest part of campus is large three-story structure with white stucco walls and a pitched red clay tile roof that is visible throughout the southern and western parts of the campus, but is generally not viewable from off-campus areas to the south because of topographic conditions that result in natural screening (VA 2002).

Buildings 203 (Main Hospital Building) and 200 (Ambulatory Care Clinic) are prominent five-story reinforced concrete structures that are visible throughout the southern part of campus and from the SFVAMC entry points on the south part of the campus.

The north-central and eastern parts of the SFVAMC campus contain numerous one- to five-story "Mayan Deco" style buildings that comprised the original campus developed in 1934. Many of the structures in this area have undergone relatively few exterior modifications since their original development (VA 2002).

3.3 AIR QUALITY

Air quality is determined by the concentration of various pollutants in the atmosphere. National Ambient Air Quality Standards (NAAQS) and California Ambient Air Quality Standards (CAAQS) have been established by the USEPA and California Air Resources Board (CARB), respectively, for criteria pollutants, including: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter equal to or less than ten microns in diameter (PM_{10}) or 2.5 microns in diameter ($PM_{2.5}$), and lead (Pb). NAAQS and CAAQS represent maximum levels of background pollution that are considered safe, with an adequate margin of safety, to protect public health and welfare.

The CAA, as amended in 1990, places most of the responsibility to achieve compliance with NAAQS on individual states. The State of California is geographically divided into Air Pollution Control Districts (APCDs) and Air Quality Management Districts (AQMDs), each of which is required to adopt strategies for achieving NAAQS, as well as the state's CAAQS. Each APCD or AQMD must also adopt a State Implementation Plan (SIP) that is a compilation of goals, strategies, schedules, and enforcement actions designed to lead the state into compliance with all NAAQS. APCDs or AQMDs not in compliance with a standard can be declared *nonattainment* areas by the USEPA or CARB.

The SFVAMC is located within the San Francisco Bay Area Air Basin (SFBAAB) and is subject to the SIP adopted by the Bay Area Air Quality Management District (BAAQMD). The SFBAAB is currently designated by the USEPA as an NAAQS *attainment* area for CO, NO_2, SO_2, $PM_{2.5}$, PM_{10}, and Pb, and a *marginal nonattainment* area for Federal 1-hour and 8-hour O_3 standards (USEPA 2008). The basin is currently designated by CARB as a CAAQS *attainment* area for CO, NO_2, SO_2, $PM_{2.5}$, PM_{10}, and Pb, and a *nonattainment* area for state 1-hour and 8-hour O_3 standards (CARB 2008).

Toxic Air Contaminants (TACs) are defined as a category of air pollutants that pose a present or potential hazard to human health, but which tend to have more localized impacts than criteria pollutants. NAAQS and CAAQS have not been established for TACs; rather, stationary sources are regulated directly through emission standards and risk reduction strategies implemented at the sources of these emissions. When a new source of TACs is proposed, a human health risk assessment may need to be conducted to estimate the project's potential risks.

3.3.1 SFVAMC

CAA Title V Operating Permit thresholds are defined as emissions from stationary sources in excess of 100 tons per year (tpy) of any of the criteria pollutants identified above, or 10 or 25 tpy of any single or combination of hazardous air pollutants (HAPs),[2] respectively (BAAQMD 2001). Since SFVAMC operating emissions are below Title V thresholds, it is considered a minor source for air emissions and operates under a BAAQMD *Synthetic Minor Facilities Permit* (Plant #459), rather than requiring a Title V Permit (BAAQMD 2009). The permit contains provisions to limit the facility's potential emission levels to below defined thresholds and applies to the facility's existing boilers, incinerator, stand-by generators, and fuel oil tanks. Table 3-1 presents a summary of permitted criteria pollutant emissions levels for each permitted source under the SFVAMC's existing BAAQMD permit (BAAQMD 2009; VA 2010d).

Table 3-1. SFVAMC – Existing BAAQMD Synthetic Minor Facilities Permit (Plant #459)

Source Description	Permitted Emission Levels (tpy)[1]				
	PM_{10}	ORG	NO_x	SO_2	CO
Fuel Oil Tanks (A, B, 203, and Pump Station)	--	<0.01	--	--	--
Diesel Pump	--	--	--	--	--
Diesel Generator (Stand-by)	0.02	0.02	0.27	--	0.05
Dual Chambered Incinerator	0.11	0.06	0.46	0.01	0.26
Space Heat Boiler (#23)	0.05	0.10	2.43	0.01	0.60
Space Heat Boiler (#24)	0.05	0.09	2.08	0.01	0.51
Space Heat Boiler (#25)	0.05	0.09	2.15	0.01	0.53
Space Heat Boiler (#26)	0.07	0.13	3.07	0.02	0.77
Portable Emergency Stand-by Diesel Generator	--	--	0.02	--	<0.01
TOTALS	**0.35**	**0.49**	**10.48**	**0.07**	**2.72**

Sources: BAAQMD 2009; VA 2010d.
Notes: [1] Entries without numerical values represent *no emissions*
tpy = tons per year
ORG = total organic gasses (comprised primarily of reactive organic gasses [ROGs] [BAAQMD 2001])
NO_x = nitrogen oxide
SO_2 = sulfur dioxide
CO = carbon monoxide

3.3.2 SFVAMC Carbon Footprint from Electricity Use

The *carbon footprint* is a measurement of all GHGs that are individually produced by an organization, institution, or other collection of activities and is a measurement of the impact that those emissions have on the environment, especially on climate change. The carbon footprint relates in particular to the amount of GHGs produced by day-to-day activities, such as burning fossil fuels for electricity generation, and is measured in units of tons (or kilograms) of CO_2 equivalents. Under existing conditions, the electricity

[2] HAPs include TACs and other air pollutants for which NAAQS and/or CAAQS have not been established.

purchased from off-site suppliers at the SFVAMC results in a carbon footprint of about 7,458 metric tons[3] of CO (USEPA 2010; VA 2010c).

3.3.3 Sensitive Receptors

Sensitive receptors are identified facilities or geographic areas that would be used by persons most sensitive to the effects of air pollution (e.g., the very young, the elderly, or people weak from illness or disease). These receptors generally consist of residences, schools, hospitals, or retirement homes. Since the SFVAMC is a medical center/hospital location with inpatients, and an employee child care center, it is considered a sensitive receptor. The nearest off-site sensitive receptors in the vicinity of the SFVAMC campus are residences located south of the facility.

3.4 COMMUNITY SERVICES AND UTILITIES

Community services comprise functional services provided to a facility by public agencies or by a facility to the community. Such services may include police and fire protection, water and solid waste service, sanitary sewer and wastewater treatment, and recreational facilities. Utilities include infrastructure services that support facility operations, including electricity, natural gas, or telecommunications. On-site utility production, such as power generation or wastewater treatment, occurs at some facilities.

3.4.1 SFVAMC

The SFVAMC is presently served by various utilities and community services. Police and fire protection are provided by the City of San Francisco, and the facility itself is a medical center/hospital facility with on-site emergency medical response services. The SFVAMC is part of the National Disaster Medical System (NDMS), a federally coordinated initiative that augments national emergency medical response capabilities. As part of the NDMS, the SFVAMC can assist state and local authorities during major disasters, and can provide support to the military medical system during overseas conflicts (VA 2010e).

The San Francisco Public Utilities Commission (SFPUC) provides water service to the SFVAMC, and the facility is located within the SFPUC combined sewer and drainage system area of service. Electricity and natural gas service is provided by Pacific Gas & Electric (PG&E), and telecommunication services such as telephone and internet are provided by AT&T. Under existing facility operating conditions, demands for water, sewer, natural gas, electricity, and telecommunications are being met (VA 2010e).

3.4.2 Energy Procurement and Distribution

As described in Section 1.1, the SFVAMC currently obtains its electricity from off-site energy supplies purchased from PG&E. In 2008, estimated facility electricity usage was 21,307 MWh, and estimated electricity costs totaled approximately $2.18 million. Presently, the use of renewable energy has not been integrated into the campus electricity supply system (VA 2010a, 2010c).

Electrical distribution equipment exists throughout the SFVAMC campus, and many facilities have been equipped with dedicated electrical switches and transformers that convert electricity from links to off-site sources into usable supplies for facility-specific functions. According to the *Solar PV Feasibility Study for the SFVAMC*, Buildings 12, 200, 203, 205, and 209 (existing parking garage) have existing electrical equipment that could be connected to newly installed solar PV systems, or are located near facilities

[3] Existing carbon emissions calculations are based upon electricity usage at the SFVAMC campus in 2008 (VA 2010c).

containing such equipment. In contrast, solar PV locations considered and eliminated (Building 208 and the proposed parking garage A), do not have existing electrical equipment and are not located near facilities containing such equipment (VA 2010a).

3.5 CULTURAL AND HISTORICAL RESOURCES

Cultural and historical resources represent and document the activities, accomplishments, and traditions of previous historical eras and link current and former users of a location or geographical area. Depending on their condition and historic use, these resources may provide insight to previous historical eras and may retain cultural or other significance to modern groups. The term *historic properties* refers to cultural resources that meet specific eligibility criteria for listing on the National Register of Historic Places (NRHP), such as age (generally at least 50 years old), architectural integrity, and/or significant association with historical events, activities, or developments. The NHPA of 1966, as amended (16 USC § 470), describes the procedures for identifying and evaluating potential historic properties; assessing the effects of Federal actions on historic properties; and consulting with the SHPO to avoid, reduce, or minimize adverse effects on such properties.

3.5.1 History of the SFVAMC Site

The present-day SFVAMC campus comprises the historic location of Fort Miley, a sub-post of the US Army Presidio of San Francisco that was originally built in 1902 and operated until the early 1930s. In 1932, the US Army deeded a majority of Fort Miley to the newly established VA, and a 21-building medical center was completed at the site in 1934. The onset of World War II in 1941 resulted in the temporary establishment of US Army operations at the SFVAMC, but patients returned to the facility by 1946. Over the following 50 years, numerous construction and renovation projects would extensively modify the SFVAMC campus to its current form. Notable projects included a phased modernization of the original facility in the 1960s, completion of several mechanical buildings in 1973, and the construction and renovation of numerous buildings and a parking garage in the southern and western areas of the SFVAMC campus between 1989 and 2000 (VA 2002, 2008).

3.5.2 Cultural and Historical Resources at the SFVAMC Site

Due to the extensive level of historical development and disturbance at the SFVAMC site, the likelihood of encountering prehistoric cultural or archaeological resources (e.g., pre-historic Native American artifacts, etc.) would be extremely limited. Parts of the SFVAMC campus were considered eligible for NRHP listing as early as 1981 due to their potential significance representing historical VA hospital development between 1925 and 1950. However, due to extensive facility modifications after 1950, the entire campus was never considered NRHP-eligible (VA 2002, 2008).

A 2002 historical assessment of the SFVAMC determined that numerous buildings developed in 1934 as part of the original campus were NRHP-eligible as part of a historic district. Specifically, the assessment identified eight buildings as *significantly* contributing to the historic district since they had undergone relatively few exterior modifications since original development. Several of these buildings, including the original hospital building, are located in the vicinity of the proposed parking garage at Parking Lot A (VA 2002). In 2008, a historic district comprising 13 contributing buildings located in the north-central and eastern parts of the SFVAMC was nominated for NRHP listing (refer to Figure 1-2). Building 13—located outside of the historic district adjacent to Buildings 12 and 205—was also noted as contributing to the historic district (VA 2008). The NRHP nomination was approved in April 2009 (VA 2010e).

3.6 FLOODPLAINS, WETLANDS, WATERSHEDS, RIVERS, LAKES, AND COASTAL ZONE

Coastal and inland water resources include wetlands, watersheds, rivers, and lakes, as well as surface waters and waterways associated with coastal areas. These water resources are important for a variety of reasons, including economic, ecological, recreational, and human health. Floodplains are belts of low, level ground present on one or both sides of a stream channel and are subject to either periodic or infrequent inundation by flood water. Inundation dangers associated with floodplains have prompted legislation that limits development in these areas, including the delineation of floodplains by the Federal Emergency Management Agency (FEMA). Wetlands are water-saturated areas such as swamps, marshes, and bogs that support a prevalence of vegetation typically adapted for life in water-saturated soils. Jurisdictional waters of the United States, including wetlands, rivers, and lakes, are those subject to regulatory authority under Section 404 of the CWA. Wetlands are further protected under EO 11990, *Protection of Wetlands*. Coastal zone management areas are sites designated by the CZMA as containing potentially sensitive resources that may affect or be affected by coastal water resources. Development in these areas may also be restricted as necessary to protect such resources.

3.6.1 SFVAMC

The SFVAMC campus is an extensively developed site that does not contain any wetlands or natural waterways. All surface runoff at the campus is collected and discharged via a combined sewer and drainage system. FEMA-delineated floodplain maps are unavailable for the SFVAMC campus vicinity; however, due to the elevated bluff-top location, flooding hazards are not anticipated to be present (VA 2010c). Portions of the SFVAMC campus are situated within a Coastal Zone Management Area, including Building 205. The SFVAMC continues to actively consult with Coastal Commission staff on actions that may affect land or water uses or natural resources along the coast (VA 2010e).

3.7 GEOLOGY AND SOILS

Geology and soils consist of surface and subsurface materials and their properties, including stability, structure, slope, erodibility, and relative compatibility or constraining properties with regard to particular construction activities and types of land use. Geologic hazards, including seismic ground shaking and seismic-related ground failure, liquefaction, or landslides, are often directly related to the geological features of a project site and may result in adverse conditions with regard to structural safety.

3.7.1 SFVAMC

The SFVAMC site in underlain by intensely sheared rock fragments embedded in a soft soil matrix. The rock fragments originate from the Franciscan formation, a geological assemblage that underlies most of the City of San Francisco and adjacent peninsula to the south. In the SFVAMC site vicinity, deposits of Quaternary-age (less than 2.6 million years ago) sand are intermixed with weathered Franciscan bedrock (VA 2010e).

The SFVAMC campus is not located within an Earthquake Fault Zone, as defined by the Alquist-Priolo Earthquake Fault Zoning Act, and no fault lines are mapped on the campus site. However, at least three minor fault lines have been observed in the campus vicinity, and visible landslide scarps have been observed adjacent to the northern part of the SFVAMC campus. Given the regional seismic conditions and history of significant seismic events on and near the San Francisco Peninsula, slope stabilization and structural seismic retrofitting are common practice in the region (VA 2010e).

Slope stabilization is presently in progress in the northern part of the campus, and seismic retrofitting to reduce potential earthquake damage has occurred on a number of SFVAMC buildings. The campus retrofitting program is ongoing. All facilities at the SFVAMC are required to undergo standard seismic safety review prior to modifications to ensure seismic safety standards are met (VA 2010e).

3.8 HYDROLOGY AND WATER QUALITY

Hydrology refers to the cyclical movement and distribution of atmospheric, surface, and subsurface water resources. Groundwater consists of subsurface water deposits contained within in soil and rock that are a potential resource for potable water consumption, agricultural irrigation, and industrial applications. Water quality describes the physical, chemical, and biological characteristics of water throughout the hydrological cycle. The quality of surface and subsurface hydrological resources is often directly related to surface water runoff quality.

3.8.1 SFVAMC

The SFVAMC is an extensively developed site where all surface runoff is collected and discharged via a combined sewer and drainage system operated by the SFPUC. Drainage from the SFVAMC would likely discharge into SFPUC's Oceanside Water Pollution Control Plant (OWPCP), where it would receive treatment and eventually be pumped to an outfall into the Pacific Ocean. The OWPCP operates under a National Pollutant Discharge Elimination System (NPDES) Permit (No. CA0037681) issued to SFPUC by the San Francisco Bay RWQCB. Per the NPDES Permit, no receiving waters for OWPCP discharges are listed on the CWA Section 303(d) impaired waters list (VA 2010e).

3.9 LAND USE

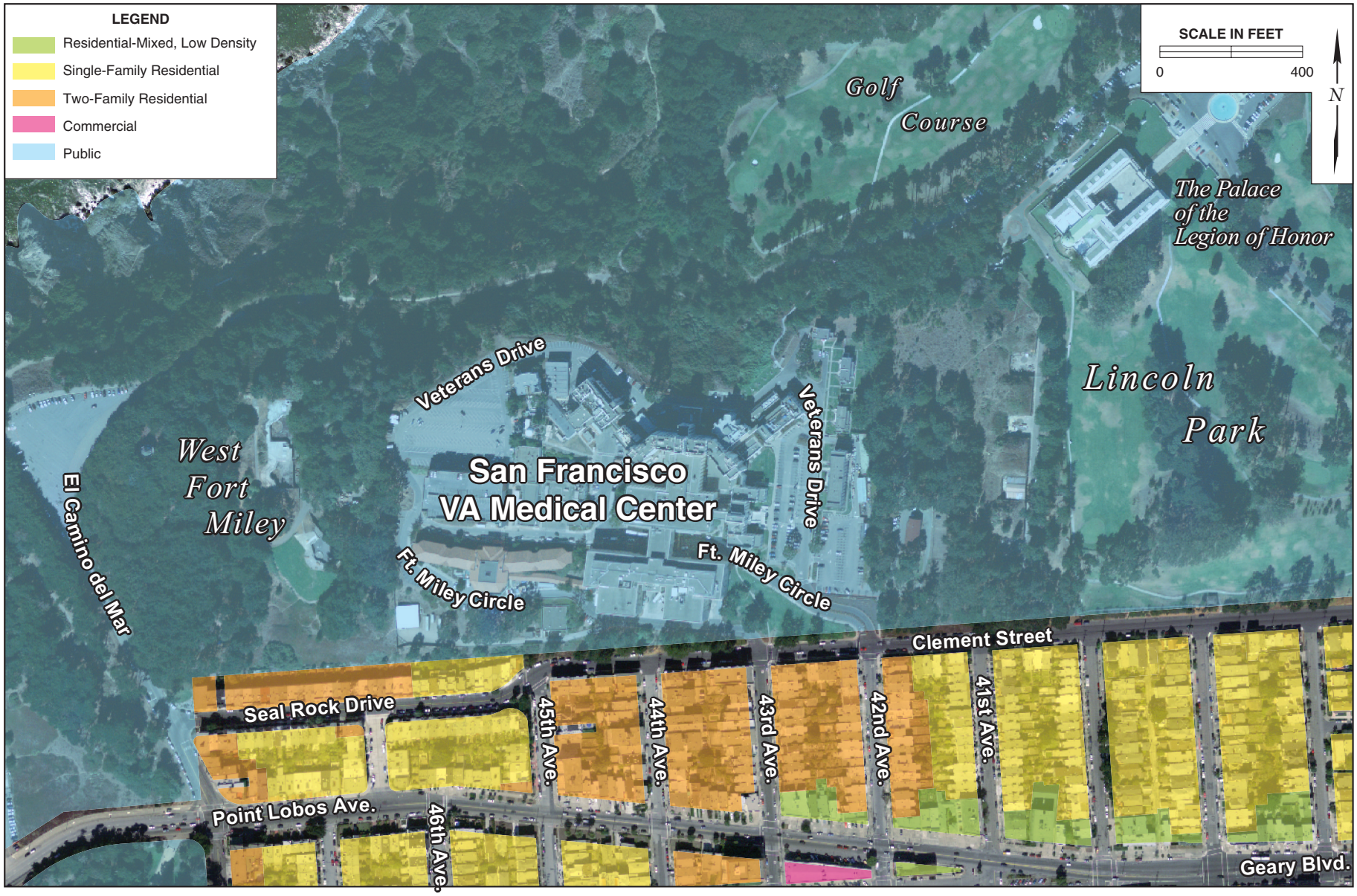
Land use describes the natural conditions or human-modified activities occurring at a particular location. Human-modified land use can include residential, commercial, industrial, transportation, agricultural, institutional, recreational, or other developed uses. Management plans and zoning regulations determine the type and extent of land use allowable in specific areas and may include measures to protect environmentally sensitive or other specially designated areas.

3.9.1 Surrounding Land Uses

Land use activities surrounding the SFVAMC campus include residential located to the south within a neighborhood known as the Outer Richmond District, and additional public use areas located to the north, east, and west, including the Golden Gate National Recreation Area to the west, north, and east, and the City- and County-owned Lincoln Park to the east. The Palace of the Legion of Honor, an internationally renowned art museum, and a public golf course are located within Lincoln Park (Figure 3-1).

3.9.2 SFVAMC

The SFVAMC campus is classified by the City of San Francisco as public use, as defined by the hospital-related uses throughout the facility. Sensitive land uses, including the main hospital building, nursing home, and child-care center, are located in the southern and eastern part of the campus. Less sensitive uses include the ancillary support functions (e.g., mechanical, engineering, and storage facilities, and parking areas) that are generally located in the central and western parts of the campus (VA 2010e).



EA

Zoning in the Vicinity of San Francisco VA Medical Center

FIGURE 3-1

3.10 NOISE

Noise is defined as any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, or otherwise results in an adverse human response. Actual response to noise can vary according to the type and characteristics of the noise source, distance between the noise source and receptor, sensitivity of the receptor, and time of day. Sensitive noise receptors are identified facilities or land uses that would be most sensitive to the effects of noise, such as residences, schools, patient care facilities, and child care centers.

The VA and City of San Francisco have established noise control measures and ordinances to reduce noise levels and exposure at the SFVAMC campus. These regulations require that noise be minimized as much as is feasible, including refraining from noise-producing work (e.g., construction) during more sensitive hours of the day (e.g., evenings and night time) or days of the week (e.g., weekends) (VA 2010e).

3.10.1 SFVAMC

The noise environment of the SFVAMC is primarily influenced by roadway traffic on and in the vicinity of the facility. Within the SFVAMC, parking lot noise (e.g., car doors, engines starting, etc.), loading docks, and building mechanical and ventilation equipment also contribute to the noise environment.

Sensitive noise receptors at the SFVAMC campus include the Main Hospital Building (Building 203), Community Living Facility (Building 208), Child Care Center (Building 32), and Mental Health Facility (Building 8) (refer to Figure 2-1). The remainder of the campus contains less sensitive noise receptors, with the least sensitive receptors being mechanical and engineering facilities (including Buildings 12 and 205) located in the central part of the campus where ambient noise associated with operation and maintenance of hospital-related equipment is the primary contributor to the noise environment. Off-site sensitive receptors include residences located to the south of the SFVAMC campus, and users of recreational areas located to the east, north, and west of the campus (VA 2010e).

3.11 SOCIOECONOMICS

Socioeconomics comprise the basic attributes and resources associated with the human environment, particularly population and economic activity. Human population is affected by regional birth, death, and migration rates, while economic activity typically includes employment, personal income, and industrial growth.

EO 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*, was issued in 1994 to focus attention of Federal agencies on human health and environmental conditions in minority and low-income communities and to ensure that disproportionately adverse human health or environmental effects on such communities are identified and addressed. Since children may suffer disproportionately from environmental health and safety risks, EO 13045, *Protection of Children from Environmental Health and Safety Risks*, was introduced in 1997 to prioritize the identification and assessment of environmental health and safety risks that may affect children and to ensure that Federal agencies' policies, programs, and activities address environmental health and safety risks to children.

3.11.1 Socioeconomics

The SFVAMC is a major tertiary-care referral center and provides outpatient, long-term, and home-based care for veterans throughout Northern California. The facility operates 124 hospital beds, as well as a 120-bed community living center. The SFVAMC is affiliated with UCSF and has the largest funded research program in the VA Health Administration. The number of employees, volunteers, and short-term residents at the SFVAMC campus totals approximately 3,075 (VA 2010e).

3.11.2 Environmental Justice

The SFVAMC campus is located in northwestern San Francisco, adjacent to the Outer Richmond neighborhood to the south, and the Sea Cliff neighborhood to the east. With regard to racial composition, demographics of the SFVAMC campus and adjacent neighborhoods[4] are similar to the City of San Francisco as a whole, with minorities representing approximately 55.8 and 54.7 percent, respectively, of the total population. Age composition is also similar for both geographical areas, with children under 18 representing approximately 14.1 and 14.7 percent, respectively, of the total population (US Census Bureau 2000, 2008). However, income characteristics for the SFVAMC campus and adjacent neighborhoods are different than the City of San Francisco: only approximately 5.9 percent of the total population of SFVAMC campus and adjacent neighborhoods is classified as below poverty level, versus approximately 11.0 percent of the City of San Francisco (US Census Bureau 1999, 2008). Refer to Appendix E for complete demographic information and calculations. The SFVAMC employee child care center, located in the eastern part of the campus, and proposed to be relocated to the north-east portion of the campus is the only location with a significant concentration of children at the SFVAMC (VA 2011a).

3.12 SOLID/HAZARDOUS WASTE AND BUILDING MATERIALS

Hazardous wastes are defined as any solid, liquid, contained gaseous, or semisolid waste, or any combination of wastes, which pose a substantial present or potential hazard to human health or the environment. The storage, handling, recycling, and disposal of hazardous wastes is subject to regulations under the RCRA (40 CFR §§ 260-270), as administered by the USEPA. Medical facilities typically handle biologically hazardous wastes and develop appropriate procedures for the handling, storage, and disposal of such wastes. Various materials used historically for the construction of buildings have been identified as potentially hazardous under certain circumstances (e.g., disturbance from demolition activities). Facility managers frequently develop management plans or other measures to address potentially hazardous materials and their relationship to various circumstances (e.g., normal operations, construction/demolition activities, etc.).

3.12.1 Solid/Hazardous Waste

The SFVAMC operates 124 acute care hospital beds, and a variety of laboratories that support operational and research procedures. The facility handles potentially hazardous medical and biological wastes, as well as other hazardous and non-hazardous solid and liquid wastes. The handling, storage, and disposal of all such wastes at the SFVAMC is subject to specified facility safety procedures and all applicable Federal, state, and local regulations (VA 2010e).

[4] The SFVAMC campus and adjacent neighborhoods have been defined by the US Census Bureau as San Francisco County Census Tracts 478, 479.01, 479.02, and 602 (US Census Bureau 1999, 2000).

3.12.2 Hazardous Building Materials

A number of buildings on the SFVAMC campus have been identified as containing asbestos, a building material that is designated and must be treated as hazardous when its fibers become friable and airborne. The SFVAMC is presently updating its *Asbestos Management Plan*, which will include procedures for regular inspection, facility personnel notification, and proper asbestos removal and disposal (VA 2010e).

3.13 TRANSPORTATION AND PARKING

Transportation systems facilitate the movement of vehicles and transportation of goods and materials through a network of roads and internal circulation systems within facilities. The quantity and availability of parking at a facility is often directly related to the anticipated number of facility users, including personnel and visitors. Transportation and parking may be quantitatively described by level-of-service (LOS) or other capacity measures.

3.13.1 SFVAMC

The SFVAMC campus is located off Clement Street in northwestern San Francisco. The campus is accessible via entrances at 42nd and 43rd Avenues, both of which connect to Geary Boulevard, a main thoroughfare located one block south of Clement Street. The campus is also accessible via public transportation by a bus route that has one stop within the SFVAMC campus. The San Francisco Municipal Transit Authority (MUNI) Route 38 begins in Downtown San Francisco and travels west to the SFVAMC. Veterans Drive is the primary circulation route through the SFVAMC campus. Veterans Drive begins at the 43rd Avenue entrance and circles the campus perimeter, eventually terminating at the 42nd Avenue entrance.

The SFVAMC campus currently has a significant shortage of available parking spaces.

There are approximately 1,214 total parking spaces on the SFVAMC campus. The largest concentration of parking spaces is in the western part of campus, including the existing 422-space parking garage (Building 209) and surface Parking Lot J, both of which are located adjacent to Building 205. Surface Parking Lots A and B comprise another large concentration of parking spaces in the eastern part of campus; the footprint of Parking Lot A is the proposed location of a new two-story parking garage. Additional parking spaces are located along Veterans Drive, including surface Parking Lot G near Building 208. Surface Parking Lot E is located between Buildings 12, 200, and 203. Patients and visitors typically park in Lots A, E, and H, and the existing parking garage, and employees park in Lots D, G, and J (VA 2010e).

A 2005 study of SFVAMC parking determined that, on a typical weekday, more than 250 vehicles from facility personnel, patients, and visitors park off-site on area streets. The study also identified a total parking shortage of at least 340 spaces at the SFVAMC, while another study identified an even greater

shortage of more than 650 spaces (VA 2010e). No studies of LOS within or adjacent to the SFVAMC have been conducted.

3.14 VEGETATION AND WILDLIFE

Biological resources include native or naturalized plants and animals and the habitats in which they occur. Sensitive biological resources are defined as those plant and animal species listed under the ESA as threatened or endangered, or proposed as such, by the USFWS. Migratory birds, as listed in 50 CFR § 10.13, are ecologically and economically important to the US, and the MBTA was enacted to protect such birds from capture, pursuit, hunting, or removal from natural habitat.

3.14.1 SFVAMC

The vast majority of the SFVAMC site is developed with buildings or paved parking and circulation areas, and any remaining areas contain mostly ornamental vegetation (e.g., maintained lawns and shrubs). Natural vegetation assemblages are located along the north, west, and east perimeters of the facility, and typically comprise high-level tree canopies and understory brush. The Monterey pine (*Pinus radiata*) and Monterey cypress (*Cupressus macrocarpa*) are common tree specimens in these areas, while understory brush primarily consists of English Ivy (*Hedera Helix*), German ivy (*Senecio mikanioides*), Himalayan blackberry (*Rubus discolor*), and passion flower (*Passiflora sp.*) (VA 2010e).

Biological resource surveys of the SFVAMC perimeter observed the red-tailed hawk (*Buteo jamaicensis*), as well as evidence of other avian species and small mammals. No special-status plant or wildlife species were detected during the surveys (VA 2010e). During an April 2, 2010 reconnaissance of the proposed solar PV system installation locations, no birds or other wildlife were observed at or in the vicinity of any of the proposed locations (VA 2010b).

SECTION 4.0
ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This chapter discusses potential environmental consequences of Alternative 1 (No-Action Alternative) and Alternative 2 (Proposed Action). Impacts analyses are presented by resource area, as described in Section 3, *Affected Environment*.

4.1.1 Impact Analyses

Under Alternative 1, the No-Action Alternative, installation of a solar PV system would not occur at any location at the SFVAMC, and the facility's electricity demand from off-site supplies would remain the same. Impact analyses under this alternative primarily focus on potential impacts associated with the continuation of baseline environmental conditions.

Under Alternative 2, the Proposed Action, installation of solar PV systems would occur at seven locations at the SFVAMC, including five locations on existing rooftops and two locations on existing and proposed parking structures (refer to Figure 2-1). Impacts analyses under this alternative may focus on temporary, short-term impacts associated with project construction, or permanent, long-term impacts associated with project operation.

4.1.2 Significance Criteria

CEQ regulations establish the term *significance* to describe the magnitude of potential impacts on the affected environment (40 CFR § 1508.27). Rather than establishing specific significance thresholds, these regulations describe the magnitude of impacts by considering both *context* and *intensity*. For proposed actions, context may consider effects on a national, regional, or local basis, and both short-term and long-term effects may be relevant. Intensity, or the severity of potential impacts, may be described by a number of factors, including:

- The degree to which an action affects public health or safety;
- The degree to which an action may affect or be affected by unique characteristics of the project vicinity, such as wetlands, floodplains, historical resources, or ecologically sensitive areas;
- The degree to which an action would adversely affect legally protected resources, such as NRHP-listed cultural and historical resources, or ESA-listed threatened and endangered species;
- The degree to which an action is related to other actions with individually insignificant but cumulatively significant impacts; and,
- Whether an action would potentially violate Federal, state, or local regulations established to ensure the protection of the environment.

In the case of the Proposed Action and No-Action Alternative at the SFVAMC, significance criteria were used for each resource area for impact analyses of the affected environment, as presented in Table 4-1.

Table 4-1. Significance Criteria for Impact Analyses

Resource Area	Significance Criteria ("An Impact Could be Significant if it…")
Aesthetics	• Adversely degrades the existing visual character or quality of the project site and its surroundings • Substantially adversely affects a scenic vista • Results in substantial light or glare
Air Quality	• Causes or contributes to a violation of NAAQS or CAAQS • Results in emissions increases that have the potential to delay the projected date for attainment of NAAQS or CAAQS • Violates procedural, operational, monitoring, or reporting requirements of the USEPA, CARB, or BAAQMD
Community Services and Utilities	• Results in an increase in wastewater generation requiring the expansion or construction of sewage treatment plants • Violates federal, state, or local treatment standards for wastewater quality • Results in an increase in demand on public utilities requiring the construction of new or expanded facilities • Results in an increase in demand for public utilities exceeding available supply • Results in an increase in demand for public services including parks, police and fire protection, or other community services such that it would exceed available supply
Cultural and Historical Resources	• Results in direct or indirect change to historical, archaeological, or paleontological resources
Floodplains, Wetlands, Watersheds, Rivers, Lakes, and Coastal Zone	• Results in construction within a 100- or 500-year floodplain • Results in loss of wetlands or adversely degrades critical environmental area of wetlands • Violates established Coastal Zone Management Area policies
Geology and Soils	• Causes substantial soil erosion or loss of top soil • Exposes people to geologic hazards such as strong seismic ground shaking, seismic related ground failure, liquefaction, or landslides.
Hydrology and Water Quality	• Causes substantial flooding, erosion, or siltation • Adversely affects any significant water body, including marine sanctuaries • Exposes people to reasonably foreseeable hydrologic hazards, such as flooding • Results in substantial alteration of surface water drainage and/or groundwater regime
Land Use	• Conflicts with established recreational, educational, or scientific uses • Conflicts with land use goals of the community • Results in substantial alteration of present or planned land use
Noise	• Violates land use compatibility criteria and applicable noise guidelines • Generates new sources of substantial noise that violates applicable noise guidelines • Increases intensity of noise levels to sensitive receptors
Socioeconomics	• Substantially alters the location and distribution of the ROI population or causes the population to exceed existing growth rates • Adversely affects the local housing market and vacancy rates • Results in substantial increase in resident population or alteration of demographic characteristics • Adversely affects local economy • Disproportionately adversely affects minority and/or low-income populations, or results in increased health and safety risks to children
Solid/Hazardous Waste	• Results in substantial increase in solid waste • Results in emissions of hazardous emissions or transportation of hazardous materials • Results in increased exposure to hazardous building materials
Transportation and Parking	• Causes traffic volumes to exceed capacity of area roadways • Causes the operating conditions at one or more approaches at an un-signalized intersection to fall to undesirable (LOS E) or unacceptable (LOS F) • Results in parking demand exceeding capacity

Table 4-1. Significance Criteria for Impact Analyses (Continued)

Resource Area	Significance Criteria ("An Impact Could be Significant if it…")
Vegetation and Wildlife	• Causes disruption to or removal of an endangered or threatened species—as protected under the ESA—its habitat, migration corridors, or breeding areas • Results in the loss of a substantial number of protected native plant or animal species that could affect abundance or diversity beyond normal variability • Causes disruption to or removal of a migratory bird protected under the MBTA, including nesting or breeding habitat

4.2 ALTERNATIVE 1: NO-ACTION ALTERNATIVE

Under the No-Action Alternative, installation of a solar PV system would not occur at any location at the SFVAMC, and the facility's electricity demand from off-site supplies would remain as described under baseline conditions.

4.2.1 Aesthetics

Under Alternative 1, installation of a solar PV system would not occur at any location at the SFVAMC. The visual characteristics of the SFVAMC campus—including Buildings 12, 200, 203, 205, and 209 (existing parking structure) — would remain the same as described in Section 3.2, *Aesthetics*. Therefore, no direct or indirect impacts to aesthetics would occur.

4.2.2 Air Quality

Under Alternative 1, installation of a solar PV system would not occur at any location at the SFVAMC. Existing electricity demand from off-site supplies would remain the same, and the carbon footprint generated by the facility's energy usage, as described in Section 3.3, *Air Quality*, would not significantly change from baseline levels. No changes to existing emissions sources at the SFVAMC and associated permitted emissions would occur under this alternative. Therefore, no impacts—direct or otherwise,—to air quality would occur under Alternative 1. While baseline conditions would remain unchanged, beneficial impacts associated with increased use of renewable energy at the SFVAMC and associated reduction in the carbon footprint and associated emissions would not be realized.

4.2.3 Community Services and Utilities

Under Alternative 1, operations at the SFVAMC would remain as described in Section 3.4, *Community Services and Utilities*, and there would be no impact or increased demand for public services such as police and fire protection, recreational facilities, or other community services. Further, no new connections to sewer, water, telecommunications, or other utilities would be needed under this alternative. Since installation of a solar PV system would not occur under this alternative, operation of the SFVAMC would continue to rely on the purchase of electricity from off-site supplies. While baseline conditions would remain unchanged, beneficial impacts associated with increased use of renewable energy at the SFVAMC and associated energy cost savings would not be realized.

4.2.4 Cultural and Historical Resources

Under Alternative 1, no new construction or ground disturbance would occur. Cultural and historical resources at the SFVAMC would remain as described in Section 3.5, *Cultural Resources*, and no direct or indirect impacts would occur.

4.2.5 Floodplains, Wetlands, Watersheds, Rivers, Lakes, and Coastal Zone

Under Alternative 1, neither direct nor indirect impacts associated with new construction or ground disturbance would occur. Baseline conditions at the SFVAMC would remain as described in Section 3.6, *Floodplains, Wetlands, Watersheds, Rivers, Lakes, and Coastal Zone*.

4.2.6 Geology and Soils

Under Alternative 1, no impacts associated with new construction or ground disturbance would occur. Baseline conditions at the SFVAMC would remain as described in Section 3.7; therefore, selection of Alternative 1 would have neither direct nor indirect impacts on geology and soils.

4.2.7 Hydrology and Water Quality

Under Alternative 1, no direct or indirect impacts associated with new construction or ground disturbance would occur. Hydrology and water quality at the SFVAMC, including baseline surface water runoff and collection systems, would remain as described in Section 3.8, *Hydrology and Water Quality*.

4.2.8 Land Use

Under Alternative 1, no changes to existing or proposed land use would occur. Baseline conditions at the SFVAMC would remain as described in Section 3.9, *Land Use*, and no impacts to land use would occur.

4.2.9 Noise

Under Alternative 1, no short-term demolition, excavation, or construction-related noise would occur, and operational/ambient noise conditions would remain as described in Section 3.10, *Noise;* therefore, no impacts would occur.

4.2.10 Socioeconomics

Under Alternative 1, no short- or long-term changes to existing SFVAMC employment levels or population distribution would occur, and no children or nearby communities—environmental justice or otherwise—would be adversely affected. Baseline conditions would remain as described in Section 3.11, *Socioeconomics*.

4.2.11 Solid/Hazardous Waste

Under Alternative 1, no increases in the handling, storage, and disposal of solid or hazardous waste would occur at the SFVAMC, and the facility would still be subject to existing safety procedures and regulations described in Section 3.12, *Solid/Hazardous Waste*. Since no construction activities would occur under this alternative, hazardous building materials would not be an issue, and no impacts to solid/hazardous waste would occur.

4.2.12 Transportation and Parking

Under Alternative 1, no short-term construction-related increases in the number of vehicles traveling to and from the SFVAMC would occur, and parking spaces would not be displaced to facilitate the establishment of temporary construction staging areas. Further, no additional employees would be associated with the SFVAMC; therefore, no significant, long-term operational increases associated with

an increase of employees and associated increases in transportation and parking demands would occur. Transportation and parking would remain as described in Section 3.13, *Transportation and Parking*, and no impacts would occur.

4.2.13 Vegetation and Wildlife

Under Alternative 1, no new construction or ground disturbance would occur, and no vegetation or wildlife habitat at or in the vicinity of the SFVAMC would be modified. Vegetation and wildlife would remain as described in Section 3.14, *Vegetation and Wildlife*; therefore, no direct or indirect impacts would occur.

4.3 ALTERNATIVE 2: PROPOSED ACTION

Under the Proposed Action, installation of solar PV arrays would occur at five locations at the SFVAMC, including four locations on existing flat and pitched rooftops and one location on an existing parking structure (refer to Figure 2-1). For flat-roof installation locations (Buildings 12, 200, 203, and 205), solar PV cells, mounting structures, and supporting hardware would be installed directly onto the rooftop ballast material. For installation on the existing parking structure, solar PV cells and associated equipment would be installed on newly constructed carport structures. Electricity generated from the newly installed solar PV arrays would be seamlessly integrated into the SFVAMC electricity distribution system via new and/or existing electrical equipment (e.g., utility lines, switching and transformer equipment, etc.).

The timeline for installation of each solar PV system would vary by location, but would generally last between two to four weeks, with installation of additional components (e.g., carport structures, additional structural rooftop supports, electrical equipment connections, etc.) potentially extending the timeframe at some locations. All construction activities would be limited to the rooftop project sites and adjacent areas where electrical equipment connections would be installed and/or staging areas would be established, as needed. Construction personnel would average ten or fewer for each solar PV system installation. If necessary, existing structures would be seismically upgraded to support rooftop solar PV system installation. The actual timeframe for implementing each proposed solar PV system installation would depend on available funding, but would likely occur between FY 2011 and 2015.

4.3.1 Aesthetics

Implementation of the Proposed Action would result in the installation of solar PV arrays at five locations on the SFVAMC campus: the flat rooftops of Buildings 12, 200, 203, and 205 in the central part of the campus; and on a newly constructed carport structure on top of the existing parking garage (Building 209) in the western part of the campus. All equipment associated with the proposed solar PV arrays would be contained within the rooftop project sites or adjacent internal areas, and no additional external structures would be constructed or otherwise modified.

The construction footprint of each solar PV system installation would be limited to the rooftop project sites and, where needed, adjacent staging areas. Accordingly, construction activities would not adversely affect the visual setting of the SFVAMC campus.

Flat-roof solar PV arrays are designed to accommodate existing mechanical equipment.

Installation of solar PV arrays on flat roof surfaces would generally occur in areas containing existing mechanical equipment. The addition of solar PV arrays would not substantially increase the height or otherwise modify the visual setting of these areas. None of the flat-roofed buildings upon which solar PV arrays would be installed (Buildings 12, 200, 203, and 205) comprise sensitive or unique visual resources. All of these buildings consist of one- to four-story reinforced-concrete structures, and are located in an area within the SFVAMC campus that has been significantly built and subsequently modified, with no contributing architectural merit (VA 2002). Further, views of the flat-roof installation sites would be limited to nearby on-campus facilities, and would not be visible from sensitive off-campus areas (e.g., Clement Street, Golden Gate National Recreation Area) given their location on campus, and topographic and setback conditions between these areas and sensitive receptors to the north and south.

Installation of solar PV arrays on the existing parking garage would occur on newly constructed carport structures approximately 8 to 10 feet high. These structures would be visible from nearby on- and off-campus areas; however, the carport support structures would be designed to be consistent with the visual character of the parking garage. Partial screening would occur given topographic variations that limit available lines-of-site from lower off-site locations, blockage of some views by other onsite buildings, and setbacks from the perimeter of the rooftop due to driveway and associated clearance requirements. In addition, existing parking structures include some architectural elements (e.g., intermittent walls approximately 4-6 foot-high walls) that would partially screen the structures.

Installation of rooftop carport structures would not substantially increase the height or change the overall appearance of existing and proposed parking structures, given partial screening by existing architectural elements, setbacks from the structure's perimeter, and topographic conditions.

Overall, each solar PV system would be designed and installed such that it would be visually compatible with its immediate location and adjacent areas. Therefore, implementation of the Proposed Action would not alter scenic vistas, nor would it significantly impact the existing visual character of the SFVAMC campus or surrounding areas. In addition, incorporation of BMPs—including the use of hooded, downward-oriented lighting fixtures to reduce night light or glare—would occur where appropriate and practicable to further reduce effects on the local visual setting.

4.3.2 Air Quality

Under the Proposed Action, construction activities would vary depending on the installation locations of each solar PV system. Installation of electrical equipment connections would also vary by location. For locations containing existing electrical equipment (Buildings 200, 203, and 205, and the existing parking structure), utility lines and switching and transformer equipment would be installed internally among existing equipment. Building 12 does not contain existing electrical equipment; utility lines would be

extended externally as feasible, with minor trenching occurring in previously developed areas if necessary to connect with existing equipment at an adjacent location.

Pre-installation activities would include the use of mobile equipment (e.g., heavy-duty trucks) for delivery of the solar PV cells and associated equipment. Installation activities would also include the use of mobile equipment for component and material delivery, as well as small cranes to hoist the solar PV cells, associated equipment; for the pitched-roof location, additional mounting structures would also need to be lifted onto the roof. Stationary equipment (e.g., concrete mixers) may also be required to support component installation.

Under the Proposed Action, the timeline of construction activities would generally last between two to four weeks depending on the size of the solar PV system that would be installed and the need or lack thereof for construction of additional components. However, the actual use of mobile and stationary construction equipment would be limited to specific timeframes associated with various construction phases (e.g., hoisting equipment onto rooftops). All construction activities would be limited to the rooftop project sites and, as needed, adjacent areas where electrical equipment connections would be installed. Where required, construction staging areas may also be established adjacent to the project sites.

The use of mobile and stationary equipment during construction activities could create fugitive dust (e.g., PM_{10}), a criteria pollutant, as well as various emissions resulting from diesel fuel combustion (e.g., nitrogen oxide [NO_X], CO, SO_2, etc.). The BAAQMD acknowledges reactive organic gases (ROG) and oxides of nitrogen (NO_x) resulting from construction-related combustion emissions when determining thresholds of significance for proposed projects. However, the agency's primary emphasis is on fugitive dust generated during construction activities. The BAAQMD approach for determining the threshold of significance for construction-related fugitive dust is based on the implementation of effective and comprehensive control measures rather than a detailed quantification of potential dust emissions (BAAQMD 2009). While implementation of the Proposed Action would include very few dust-generating activities and minimal ground disturbance, BAAQMD control measures for fugitive dust applicable to the project (e.g., daily sweeping and watering of construction areas) would further reduce construction-related air quality impacts.

Operation of the solar PV arrays under the Proposed Action would not result in any changes to existing emissions sources at the SFVAMC and associated permitted emissions under the facility's existing BAAQMD *Synthetic Minor Facilities Permit* (Plant #459). Under the Proposed Action, the estimated *carbon footprint* associated with electricity use at the SFVAMC—the annual amount of carbon emissions produced by the generation of electricity currently purchased from off-site supplies—would decrease by about 4.4 percent (i.e., 329.6 metric tons of CO_2 or the annual equivalent emissions of approximately 63 automobiles) (USEPA 2005, 2010). Estimated carbon reductions under the Proposed Action would be attributed to anticipated electricity generated by the proposed solar PV arrays that would replace electricity currently purchased from off-site supplies. (It is important to note that carbon generation has been estimated based on the typical carbon generated for the procurement of electricity in California [USEPA 2010]; actual baseline carbon emissions and potential reductions under the Proposed Action may vary.) Refer to *Appendix C* for baseline and Proposed Action carbon footprint calculations.

The Proposed Action would not cause or contribute to a violation of NAAQS or CAAQS; result in emissions increases that have the potential to delay the projected date for attainment of NAAQS or CAAQS; or violate procedural, operational, monitoring, or reporting requirements of the USEPA, CARB, or BAAQMD. Long-term emissions at the SFVAMC would remain unchanged from baseline conditions,

and long-term carbon emissions associated with facility electricity use would be reduced. Accordingly, *beneficial* long-term impacts to air quality would result from implementation of the Proposed Action.

4.3.3 Community Services and Utilities

Under the Proposed Action, each solar PV system would be integrated into the SFVAMC electricity distribution system via new and/or existing electrical equipment, including utility lines, and switching and transformer equipment. For locations containing existing electrical equipment (Buildings 200, 203, 205, and the existing parking structure), utility lines and switching and transformer equipment would be installed internally amongst existing equipment. For Building 12, which does not contain existing electrical equipment, utility lines would be extended externally as feasible, with minor trenching occurring in previously developed areas if determined necessary to connect with existing equipment at an adjacent location. Interruptions to existing electricity service to integrate the newly installed solar PV arrays would be limited, and are not anticipated to last more than 24 hours. BMPs would be in place during system integration to ensure service disruptions are limited and back-up generators would be ready for use in the event that a disruption would be needed. Accordingly, potential disruptions to electricity service at the SFVAMC associated with short-term construction activities would be less than significant.

Under the Proposed Action, the combined annual electricity output of the solar PV arrays would total approximately 941.5 MWh, or about 4.4 percent of existing electricity usage at the SFVAMC[5] (VA 2010a, 2010c). The demand for electricity presently purchased from off-site supplies—and associated costs and carbon emissions—would be reduced due to solar PV system installation. Further, the SFVAMC would benefit from renewable energy incentives[6] due to installation of the solar PV arrays that would further reduce annual electricity costs at the facility (VA 2010a). Therefore, long-term *beneficial* impacts to utilities would result from the Proposed Action.

Table 4-2 presents a comparison of electricity usage at the SFVAMC under existing conditions and with operation of the solar PV arrays under the Proposed Action—including associated maintenance and utility costs, potential savings from renewable energy incentives, and carbon emissions. Refer to *Appendix C* for baseline and Proposed Action operational cost calculations.

There would be no impact or increased demand for public services such as police and fire protection, recreational facilities, or other community services under this alternative. Further, there would not be any violations of Federal, state, local treatment standards for wastewater treatment. No new connections to sewer, water, natural gas, or telecommunications systems would be needed under the Proposed Action. Therefore, no significant short-term construction-related or long-term operational changes to community services or utilities would occur.

4.3.4 Cultural and Historical Resources

Under the Proposed Action, installation of the proposed solar PV arrays would not require the establishment of any new construction footprints, and any potential ground disturbance from trenching would be minimal and, if required, would take place in previously disturbed areas (e.g., previously graded building and parking pads). Therefore, the potential to encounter subsurface archaeological resources would be very limited.

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[5] Based upon 2008 electricity usage of 21,307 MWh (VA 2010c).
[6] Incentives of $52.00/MWh would be available to the SFVAMC based upon anticipated annual solar PV system electricity output (VA 2010a).

Table 4-2. SFVAMC Electricity Usage: Existing Conditions and Proposed Action

Electricity Usage Scenario	Annual Electricity Usage Indicators		
	Unit/Quantity[1,2,3]	Cost[4,5]	Carbon Emissions[5]
Electricity (off-site supply)	21,307 MWh	$2,556,840	7,457.5 mt
Total: Existing Conditions	**21,307 MWh**	**$2,556,840**	**7,457.5 mt**
Electricity (solar PV arrays)	(941.5 MWh)	$0	<0.01 mt
Electricity (off-site supply)	20,365.5 MWh	$2,443,860	7,127.9 mt
Maintenance Costs (solar PV arrays)	$0.000021/MWh, solar PV system	$19,772	
Renewable Energy Incentives (solar PV arrays)	($52.00/MWh), solar PV system	($48,958)	
Total: Proposed Action[3]	**20,366 MWh**	**$2,414,674**	**7,127.9 mt**
TOTAL CHANGE	**–941.5 MWh**	**–$141,965**	**–329.6 mt**
Percent Difference	**–4.4%**	**–5.6%**	**–4.4%**

Sources: USEPA 2010; VA 2010a, 2010c.
Notes: mt = metric tons
MWh = megawatts hours
[1] Electricity usage based on 2008 SFVAMC electricity usage (VA 2010c).
[2] Incentives of $52.00/MWh would be available under existing regulatory conditions to the SFVAMC based upon anticipated annual solar PV system electricity output (VA 2010a).
[3] Total represents *electricity purchased from off-site suppliers only* (VA 2010a, 2010c).
[4] Electricity costs are based upon $120.00/MWh (VA 2010a).
[5] Refer to *Appendix C* for operational cost and carbon footprint calculations (USEPA 2010; VA 2010a, 2010c).

Of the five proposed solar PV system installation locations, none would be fully located within the NRHP-listed SFVAMC historic district. None of the rooftop sites of the Proposed Action are located upon buildings that have been designated as contributing resources to the SFVAMC historic district (VA 2002; VA 2008). Operational and construction staging activities would be established upon, within, or in the immediate vicinity of each proposed installation site, and none would adversely affect historic resources at SFVAMC. No disturbance would occur to designated historic resources located adjacent to several of the proposed installation sites. Therefore, operational and construction-related impacts to cultural, historical, archaeological, and paleontological resources under the Proposed Action would be less than significant.

4.3.5 Floodplains, Wetlands, Watersheds, Rivers, Lakes, and Coastal Zone

Implementation of the Proposed Action would take place in an area that does not contain any wetlands or natural waterways, and where flooding hazards are not known to be present. All proposed solar PV system installation sites would be located within a Coastal Zone Management Area; however, all activities would be confined to the individual sites and, where needed, adjacent staging areas, and none would affect land or water uses or natural resources along the coast. Accordingly, implementation of the Proposed Action would result in less than significant impacts to floodplains, wetlands, watersheds, rivers, lakes, and the coastal zone.

4.3.6 Geology and Soils

Under the Proposed Action, construction activities would not require grading or extensive ground disturbance. At Building 12, utility lines would need to be extended to existing electrical equipment at an

adjacent location. As feasible, utility lines would be extended externally, and any potential ground disturbance from trenching would be minimal and would take place in previously paved areas. Accordingly, no direct loss of top soils or potential for soil erosion would occur during project construction. Installation of the proposed solar PV arrays would not affect existing rooftop stormwater collection and discharge systems at any of the project sites and, where required, the solar PV arrays would include gutters to collect and discharge stormwater into the SFVAMC drainage system. Runoff associated with solar PV system maintenance (i.e., periodic rinsing to remove accumulated dust and debris) would also be managed through the campus drainage system and application of BMPs for surface water drainage. Therefore, operation of the proposed solar PV arrays is not anticipated to result in significant impacts related to soil erosion or loss of top soils.

Implementation of the Proposed Action would take place in an area where seismic activity is likely, and potential geologic hazards (e.g., minor fault lines, landslide scarps, etc.) have been observed in the general vicinity. To reduce the severity of potential seismic risks, a standard seismic evaluation of each building upon which the solar PV arrays would be located would occur prior to system installation and seismic upgrades would be incorporated as part of construction activities associated with the Proposed Action, if necessary. Therefore, following the incorporation of any necessary preventative and/or protective measures deemed appropriate, long-term impacts associated with seismic and other potential geologic hazards would not be adverse.

4.3.7 Hydrology and Water Quality

Implementation of the Proposed Action would occur in an area where all surface runoff is collected and discharged via a combined sewer and drainage system. Due to the developed nature of the SFVAMC campus, the likelihood of flooding, erosion, or siltation would be extremely limited. In addition, no new impervious surface areas would be established under the Proposed Action, and, where required, the solar PV arrays would include gutters to collect and discharge stormwater into the SFVAMC drainage system. Surface water runoff associated with solar PV system maintenance (i.e., periodic rinsing to remove accumulated debris) would also be managed through the campus drainage system and application of BMPs for surface water drainage. Therefore, the Proposed Action would not alter surface or groundwater characteristics onsite. In addition, the project would not expose people to foreseeable hydrologic hazards; therefore, direct and indirect impacts to hydrology and water quality would be less than significant.

Construction and operational activities associated with the Proposed Action would require the use of equipment containing potentially polluting substances (e.g., oils, lubricants, etc.), as well as the storage and handling of small quantities of hazardous materials. Regular inspection and maintenance of equipment and implementation of standard safety procedures for hazardous materials storage and handling would reduce the likelihood of releases that could enter SFVAMC's drainage system. Operationally, no long-term substantive changes in the hazardous materials inventory or relevant handling procedures would be necessary to support the solar PV arrays. Therefore, the Proposed Action is not anticipated to result in releases that would adversely affect hydrology and water quality, and impacts would be less than significant.

4.3.8 Land Use

Installation of the proposed solar PV arrays would not introduce any incompatible land use activities at the SFVAMC. For rooftop installation locations (Buildings 12, 200, 203, and 205), the solar PV arrays would be installed amongst existing compatible rooftop equipment (e.g., mechanical equipment). For the solar PV array installation on the existing parking structure, the solar PV arrays would be installed on

newly constructed carport structures that would be compatible with the parking uses at this location. Any electrical utility lines and switching and transformer equipment installed as part of the Proposed Action would be installed among existing compatible equipment as feasible and would be seamlessly integrated into the SFVAMC electricity distribution system. Further, activities under the Proposed Action would not result in any modification to land use outside the SFVAMC or conflict with any off-site land use goals or established recreational, educational, or scientific uses. As a result, no significant direct or indirect impacts to land use would occur from implementation of the Proposed Action.

4.3.9 Noise

Implementation of the Proposed Action would take place in varying noise environments on the SFVAMC campus. A majority of the solar PV system installation sites would be located in portions of the campus where parking lot noise and/or mechanical and ventilation equipment noise influences the ambient noise environment, including Buildings 12 and 205 and the existing parking structure. However, several of the project sites would be comprised of either moderately sensitive (Building 200) or at one of the most sensitive noise receptors on campus (Building 203). Construction activities could potentially result in short-term noise increases above ambient levels which would be potentially adverse, especially with regard to sensitive receptors in Building 203. However, general BMPs such as weekend and nighttime restrictions of construction-related activities and the use of noise-controlled construction equipment would be in place to ensure that short-term nuisance noise issues are reduced to the maximum extent feasible. In addition, specific BMPs would be implemented to avoid adverse noise impacts to sensitive receptors in Building 203, including the use of special noise-deafened equipment and limiting noise-producing construction activities (e.g., solar PV system assembly) to off-site areas to the maximum extent feasible. Accordingly, with implementation of BMPs, impacts associated with construction-related noise would be less than significant.

Once installed, operation of the proposed solar PV arrays would not generate any noise. Maintenance activities associated with solar PV system operations would include routine inspections and periodic rinsing of the PV system to remove accumulated debris. Noise produced by these activities would be minimal and maintenance would not occur during weekend or nighttime hours to the extent feasible. The Proposed Action would not create a conflict with regard to land use compatibility criteria or established noise guidelines, nor would it result in long-term increases in intensity of noise levels to sensitive receptors. Therefore, direct and indirect operations-related noise under the Proposed Action would be less than significant.

4.3.10 Socioeconomics/Environmental Justice

Construction activities associated with each solar PV system installation would employ an average of ten or fewer personnel, thereby resulting in temporary, minor changes to employment levels at the SFVAMC. Once operational, maintenance of the solar PV arrays would require a maximum of one part-time individual, and no long-term changes to existing employment levels at the SFVAMC would result. Therefore, implementation of the Proposed Action would not impact local housing, demographics, or the local economy, and impacts to socioeconomics would be less than significant.

The demographics of the SFVAMC campus and adjacent neighborhoods do not comprise disproportionately high concentrations of minorities or low-income populations. All activities associated with the Proposed Action would be confined to the immediate vicinity of the proposed solar PV installation sites—areas with no significant concentrations of children. No project-related activities would affect off-site populations—minority, low-income, or otherwise—or areas where significant

concentrations of children may gather. Accordingly, implementation of the Proposed Action would not adversely affect minority or low-income populations or children, and direct and indirect impacts to environmental justice and the protection of children would be less than significant.

4.3.11 Solid/Hazardous Waste

Construction and operational activities associated with the Proposed Action would require the handling, storage, and disposal of small quantities of solid and hazardous waste. However, all activities would be subject to safety procedures and regulations described in Section 3.12, *Solid/Hazardous Waste*, and impacts to solid waste would be less than significant.

Implementation of the Proposed Action would take place on and in the immediate vicinity of facilities identified as containing the hazardous building material asbestos. However, construction activities are not expected to disturb existing building materials—asbestos-containing or otherwise—and any potential removal or disposal of such materials would be subject to procedures outlined in the SFVAMC *Asbestos Management Plan*. Accordingly, impacts associated with hazardous building materials would be less than significant.

4.3.12 Transportation and Parking

Under the Proposed Action, construction activities associated with installation of each solar PV system would result in short-term increases in traffic and parking demand at the SFVAMC campus. However, the installation of each solar PV array would not occur simultaneously but would rather occur at varying intervals between FY 2011 and 2015, and the duration of each installation would be generally between two and four weeks. For the duration of installation activities, a total of ten of fewer project personnel would travel to and from the SFVAMC campus. The delivery and temporary storage of solar PV array components would also occur at various times during installation and could require the temporary closure of a small number of parking spaces adjacent to the installation sites. Since a parking shortage has been identified at the SFVAMC campus and on-site circulation is limited primarily to one perimeter access route (i.e., Veterans Drive), any increases in traffic and parking demand could be potentially adverse. However, given the short-term and non-simultaneous timelines of each solar PV installation and with incorporation of standard BMPs during installation (e.g., scheduling system component deliveries during off-peak parking hours, minimizing the use of parking spaces for staging areas, minimizing the storage of construction materials onsite, etc.), construction activities associated with the Proposed Action would result in less than significant impacts to transportation and parking.

Once operational, maintenance of the solar PV arrays would require a maximum of one part-time individual; therefore, less than significant long-term impacts to transportation and parking—both direct and indirect—would result.

As part of the Proposed Action, carport structures would be installed on top of the existing parking garage to mount the solar PV arrays. In order to minimize the temporary closure of parking spaces during installation, the carport structures would be assembled to the extent feasible prior to being hoisted onto the parking garages. The carport structures would be designed so that the placement of structural supports (i.e., columns) would minimize the loss of any parking spaces. Accordingly, impacts to transportation and parking specifically associated with installation of the carport structures would be less than significant.

4.3.13 Vegetation and Wildlife

Under the Proposed Action, installation of the proposed solar PV arrays would not require the establishment of any new construction footprints in undeveloped areas. Any potential ground disturbance from trenching would be minimal and would take place in previously developed areas, if required. Establishment of construction staging areas would largely take place in the immediate vicinity of each installation site and would generally be limited to existing paved areas. No significant or otherwise sensitive wildlife habitat is located in the vicinity of any of the installation sites, and construction activities would not disturb or otherwise adversely affect any of the ornamental vegetation located in the vicinity of the installation sites. Therefore, construction-related impacts to vegetation and wildlife from implementation of the Proposed Action would be less than significant.

During recent biological surveys of the SFVAMC perimeter, no special-status plant or wildlife species were detected; however, red-tailed hawk and evidence of other avian species was observed (VA 2010e). During an April 2, 2010 reconnaissance of the proposed solar PV system installation sites, no birds or other wildlife were observed at or in the vicinity of any of the installation sites (VA 2010d). However, to prevent potential impacts to migratory birds, and to ensure other potentially occurring special-status wildlife species are protected, BMPs to provide appropriate biological monitoring and evaluation will be followed should an active nest or other evidence of special-status wildlife species be discovered in the vicinity of any of the installation sites.

Operation of the solar PV arrays would not result in any increased ambient noise or other potential physical hazards (e.g., moving equipment, increased risk of electrical shock, etc.), and any impacts to wildlife would be less than significant. Therefore, the Proposed Action would not cause disruption to or removal of an endangered or threatened species protected under the ESA, its habitat, migration corridors, or breeding areas; result in the loss of a substantial number of protected native plant or animal species that could affect abundance or diversity beyond normal variability; or cause disruption to or removal of a migratory bird protected under the MBTA, including nesting or breeding habitat. Accordingly, direct and indirect impacts to vegetation and wildlife under the Proposed Action would be less than significant.

SECTION 5.0
CUMULATIVE IMPACTS

This section of the EA summarizes cumulative impacts identified for Alternative 1 (No-Action Alternative) and Alternative 2 (Proposed Action). Cumulative impacts are those that would result from the incremental impact of an action when added to past, present, and reasonably foreseeable future actions, whether Federal or non-Federal (40 CFR § 1508.7). By itself, the effects of a specific proposed action may be negligible; however, when considered in conjunction with other actions or incremental effects, the action could contribute to measurable environmental impacts. Combined effects of proposed actions must be considered collectively with those of other connected actions. The combined effects of the No-Action Alternative, Proposed Action, and other connected actions are addressed in this EA as cumulative impacts.

5.1 KEY FACTORS IN EVALUATING CUMULATIVE IMPACTS

In this EA, factors considered in evaluating potential cumulative environmental impacts included incremental direct effects on sensitive resources in the area, including natural resources, transportation, and parking, as well as indirect effects (e.g., growth-inducing effects) associated with past, present, and near-term actions when considered collectively (40 CFR § 1508.8). The analysis also considers changes to the area resulting from cumulative effects from projects planned in close proximity of the SFVAMC.

5.2 PROJECTS PLANNED IN THE VICINITY OF THE SFVAMC

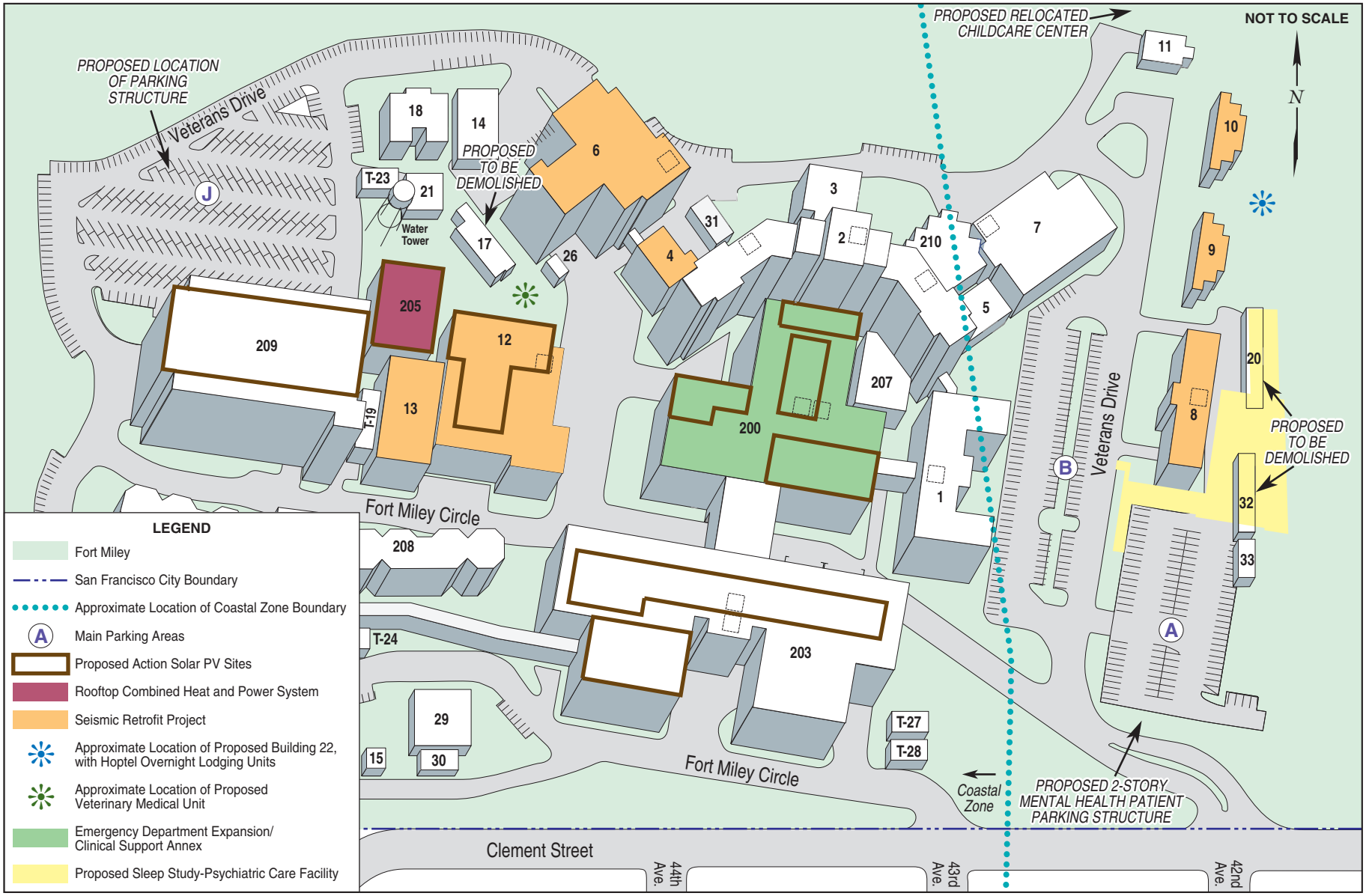
The SFVAMC is located on a 29-acre site in northwestern San Francisco (refer to Figure 1-1). The campus is located off Clement Street and is accessible via entrances at 42nd and 43rd Avenues, both of which connect to Geary Boulevard, a main thoroughfare located one block south of Clement Street. The SFVAMC campus is bounded to the south by residential neighborhoods and to the north, east, and west by the Golden Gate National Recreation Area and Pacific Ocean.

Evaluation of potential cumulative environmental impacts associated with the No-Action Alternative and Proposed Action included consideration of the effects of other proposed actions in close proximity to the SFVAMC campus, along nearby roadways, within the City of San Francisco, or on adjacent Federal lands. According to a review of environmental documents and local, state, and Federal websites, there are no major actions planned in close proximity to the campus that would have the potential to result in cumulative environmental impacts.

There are no other known transportation improvements proposed in the immediate vicinity of the SFVAMC campus. No other proposed actions are known in the campus vicinity that would result in cumulative effects when considered in conjunction with the No-Action Alternative or Proposed Action.

5.3 PROJECTS PLANNED AT THE SFVAMC

While a number of proposed projects have been identified for future consideration at the SFVAMC, most are in the conceptual stage and/or are not yet funded; however, the projects below have moved beyond the conceptual stage, and are considered reasonably foreseeable, in the planning or implementation stage, and/or are funded (VA 2011a)(Figure 5-1).



EA

Cumulative Projects at the San Francisco VAMC

FIGURE 5-1

Seismic Retrofit of SFVAMC Buildings. This project, currently in the design stages, would seismically retrofit Buildings 4, 6, 8, 12, and 13, which include one proposed solar PV system site (Building 12) and are located in close proximity to other proposed solar PV sites (Buildings 200 and 209).. While the exact construction timeline is unknown, project activities may potentially overlap with construction activities associated with the Proposed Action, including activities at adjacent installation sites. This project would require coordination and collaborative consideration with those responsible for implementing the Proposed Action, in order to evaluate the potential for adverse cumulative effects to transportation and parking.

Seismic Retrofit of Buildings 9 and 10, and Construction of Building 22. This project, currently in the design stages, would seismically retrofit Buildings 9 and 10, and establish overnight lodging units in a new structure (Building 22). While the project site is located in the northeastern part of the SFVAMC campus, not in the immediate vicinity of any of the proposed solar PV system installation sites, the timeline of project activities would likely overlap one or more of the solar PV system installations associated with the Proposed Action. Implementation of this project would include the establishment of a temporary construction staging area in the vicinity of Buildings 9 and 10 (and the future site of Building 22) that would require the temporary usage of several parking spaces. This project would require coordination with the Proposed Action in order to evaluate the potential for adverse cumulative effects to transportation and parking due to temporary parking space usage.

Emergency Department Expansion/Clinical Support Annex. This project would expand the Emergency Department, located in the north part of Building 200, into an adjacent ambulance entrance. Portions of the rooftop of Building 200—including the northwest and southeast corners and a raised "penthouse" structure in the central section—comprise one of the proposed solar PV system installation sites. Project implementation would include the establishment of a temporary staging area near Building 200 that would also be used during the seismic retrofit of Building 13. This project would require coordination with and collaborative consideration by those responsible for implementing the Proposed Action, particularly given that project activities would occur in the same location as one the proposed installation sites, in order to evaluate the potential for adverse cumulative effects to transportation and parking.

Construction of a Parking Garage in the Footprint of Parking Lot A. This project, construction of which commenced on 4 April 2011, involves the development of a two-story parking garage in the footprint of Parking Lot A, located in the southeast corner of the SFVAMC campus. The construction timeline is estimated to be six months in duration; therefore, project activities are not expected to overlap one or more of the solar PV system installations associated with the Proposed Action. Project implementation would temporarily eliminate approximately 80 parking spaces presently located in Parking Lot A. An alternate parking and shuttle schedule has been implemented by SFVAMC to provide several alternate onsite and offsite parking locations, with 15-minute headway shuttle service during this construction period. Once the project is completed the parking garage will provide a net gain of 80 parking spaces onsite, which will reduce existing parking congestion.

Construction of a Combined Heat and Power System upon Building 205. This project proposes the installation of a rooftop combined heat and power system a combined heat and power (CHP) system utilizing existing natural gas service connections. Installed system components would include a 1.2-megawatt gas turbine, an exhaust boiler, and ancillary electrical and control equipment. The CHP system would be installed on the roof of Building 205, one of the solar PV installation locations under the Proposed Action. The system would be contained within a newly-constructed enclosed rooftop structure and would be accessible via a newly-installed stairwell and elevator. The system would operate as an interface between existing natural gas connections and heating and cooling equipment presently located in

Building 205. Construction of the proposed CHP system would last for approximately one year. The anticipated construction footprint would be limited to Building 205 and, as required, nearby construction staging areas, minimizing the use of parking spaces. Construction personnel would average ten or fewer. If required by applicable development codes, Building 205 would be seismically upgraded to support installation of the CHP system on its rooftop. Close coordination with those responsible for implementing this project and the Proposed Action will be required to ensure that staging areas would not conflict and to minimize conflicts with potential short-term usage of parking spaces.

Construction of a Sleep Study and Psychiatric Care Facility. This project would involve the construction of Building 24, a new three-story facility (approximately 15,000 square feet) to collocate the sleep study center with the psychiatric care facility. Related to this project would be the decommissioning of Buildings 20 and 32. Building 20 is currently used for storage and Building 32, a temporary, modular building placed on the campus in 1991 contains the onsite childcare center. Prior to demolition of Building 32, the childcare center will be relocated in the northeast corner of the campus, north of Building 11. This project would require coordination with and collaborative consideration by those responsible for implementing the Proposed Action, in order to evaluate the potential for adverse cumulative effects to transportation and parking.

Construction of a new Veterinary Medical Unit (VMU). This project would involve the development of a new facility for veterinary research on the SFVAMC's main campus. The existing research facilities at SFVAMC are in poor condition and are housed in four different buildings, with a majority of the research conducted in Building 12 (which seismically is considered an "exceptionally high risk" structure), along with Trailer 17 and Building 21. The purpose of the new facility is to consolidate all VMU-related research operations into one modern facility. The site for the proposed VMU facility has been designated by the SFVAMC and would be located in a triangular open area between Buildings 6 and 12. Trailer 17 would be demolished as part of this project. This project would require coordination with and collaborative consideration by those responsible for implementing the Proposed Action, in order to evaluate the potential for adverse cumulative effects to transportation and parking.

Construction and operation of a new parking structure and Emergency Operations Center. Implementation of this project would result in construction of a new parking structure and Emergency Operations Center on the site of existing Parking Lot J in the northwestern portion of the SFVAMC campus. Once constructed, the new parking structure would provide a total of up to 348 net new parking spaces and would provide space for various emergency response facilities to enhance the ability of the VA to carry out its designated responsibilities during a natural disaster or national emergency. This project would require coordination with and collaborative consideration by those responsible for implementing the Proposed Action, in order to evaluate the potential for adverse cumulative effects to transportation and parking.

Implementation of the SFVAMC Institutional Master Plan (IMP). The SFVAMC IMP would include approximately 924,200 square feet of new construction to upgrade the SFVAMC for purposes of meeting the needs of Veterans of the North Coast and San Francisco Bay Area over the next 20 years. Specifically, the SFVAMC IMP involves the construction of new buildings/structures for patient care, research, administration, and parking, as well as retrofitting of seismically deficient buildings. Program components would require coordination with and collaborative consideration by those responsible for implementing the Proposed Action, in order to evaluate the potential for adverse cumulative effects to transportation and parking.

5.4 CUMULATIVE IMPACTS

Based on the other identified projects at and in the vicinity of the SFVAMC campus, *transportation and parking* is identified as the primary resource area that would be susceptible to adverse cumulative environmental effects. However, these impacts—in all cases—would be temporary and relatively short-term. Adverse cumulative impacts to other evaluated resource areas—*aesthetics, air quality, cultural resources, floodplains, geology and soils, hydrology/water quality, land use, noise, socioeconomics, solid/hazardous waste*, and *vegetation and wildlife*—would not be anticipated to occur, even when considered collectively with other identified past, current, or reasonably foreseeable actions.

Ultimately, the other identified projects at the SFVAMC campus, individually and when combined with the Proposed Action, would have long-term, beneficial impacts to *community services and utilities*. Installation of the proposed solar PV arrays, when combined with proposed seismic improvements and emergency service and clinical expansion at campus, would enable the VA to provide safer and better services to the community served by the SFVAMC.

Short-term cumulative effects associated with construction activities would increase traffic volumes on local roadways (e.g., Clement Street) and within the SFVAMC campus. During construction phases, depending on the extent to which timelines overlap, increased demand for parking during construction, coupled with the closure of multiple parking spaces to establish temporary construction staging areas would likely have short-term, adverse cumulative effects on parking at the campus since the SFVAMC's inventory of parking spaces is already in a deficit situation. Implementation of applicable BMPs identified in Chapter 4, and coordination with the City of San Francisco and applicable surrounding Federal agencies on the timing of any temporary parking area closures, would help to offset these short-term, cumulative effects. However, it is recommended that the simultaneous closure of multiple parking spaces in multiple areas of the SFVAMC campus be avoided to the extent practicable.

SECTION 6.0
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APPENDIX A

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APPENDIX A
INTERESTED FEDERAL, STATE, AND LOCAL AGENCIES

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APPENDIX B

GLOSSARY OF TERMS

APPENDIX B
GLOSSARY OF TERMS

Ballast — Rooftop material upon which solar PV arrays can be directly installed without a mounting structure.

Carbon Dioxide (CO_2) — A by-product generated by the combustion of fossil fuels. Carbon monoxide (CO), a related compound, is a criteria pollutant.

Carbon Footprint — The measurement of all greenhouse gasses (GHGs) that are individually produced by an organization, institution, or other collection of activities. The carbon footprint is a measurement of the impact that those emissions have on the environment, especially on global climate change. The carbon footprint of electricity generation is measured using emission factors for criteria pollutants.

Criteria Pollutants — Pollutants typically measured to evaluate the air quality of a geographical area. Criteria pollutants include: ozone (O_3), CO, nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter equal to or less than ten microns in diameter (PM_{10}) or 2.5 microns in diameter ($PM_{2.5}$), and lead (Pb).

Emission Factors — Representative values that relate the quantity of a pollutant released into the atmosphere with an activity associated with the release of that pollutant. The combustion of fossil fuels to generate electricity, for example, has emission factors for criteria pollutants.

Feasibility Study — An evaluation of the viability of a proposed system, using a variety of factors such as actual installation and operation costs, return on investment, available incentives, and physical and environmental considerations.

Global Climate Change — The increase of trapped heat within the Earth's atmosphere (known as the "greenhouse effect") that has been attributed from the increased combustion of fossil fuels and associated releases of GHGs.

Greenhouse Gasses (GHGs) — Atmospheric gasses, both naturally-occurring or created by the combustion of fossil fuels, that create a "greenhouse effect" in the Earth's atmosphere by trapping heat. Increased combustion of fossil fuels has been attributed to global climate change.

Incentive — A financial reward for utilizing a particular service or resource. An organization may receive an incentive in the form of reduced energy costs based on the amount of renewable energy that it generates.

Methane (CH_4) — A colorless, flammable, odorless hydrocarbon gas that is the major component of natural gas. CH_4 is a GHG.

Mounting Hardware — The actual hardware upon which solar PV arrays are installed. Such hardware may, in turn, be installed on a mounting structure.

Mounting Structure — A physical structure upon which solar PV arrays are installed for additional support. Carports may comprise mounting structures for solar PV arrays installed in parking areas.

mt — Metric ton(s), a unit of measure for carbon emissions.

MWh — Megawatt hour(s), a standard unit of energy typically used to measure electricity generation or usage.

NO_x — Oxides of nitrogen that can be released from various types of combustion processes, including natural gas and biomass combustion. NO_2, a related compound, is a criteria pollutant.

Ozone (O_3) — A compound that is formed when oxygen and other compounds react in sunlight. Though beneficial in the upper atmosphere, it is a criteria pollutant at ground level.

Photovoltaic (PV) — A composite of materials (typically including silicon) that converts solar radiation into electricity.

Power-Conditioning Equipment — Switching and transformer equipment that converts raw electricity generated by solar PV arrays into usable electricity.

Power Output — The amount of electricity generated by a solar PV system.

Particulate Matter (PM) — Very small solid airborne particles. It is a source of air pollution that can result from biomass and other combustion. PM_{10} and $PM_{2.5}$ are criteria pollutants.

Renewable Energy — An energy source that can be replaced as it is used. Renewable energy sources include solar, wind, and geothermal.

Return on Investment — The time period after which cost savings offset system installation.

Semiconductor — A material that has an electrical conductivity between a conductor and an insulator. PV technology uses semiconductor material to convert light energy from the sun into electrical energy.

Solar Cells — Individual PV cells that are often connected together to form PV modules that, in turn, can be combined and connected to form solar PV arrays of different sizes and power output.

Solar PV System — An integrated system of PV arrays that are comprised of multiple PV modules and cells.

Solar Radiation — Light produced by the Sun that can be converted into electricity via the use of PV materials.

SO_x — Oxides of sulfur that can be released from various types of combustion processes. SO_2, a related compound, is a criteria pollutant.

TACs — Toxic air contaminants, or a category of air pollutants that pose a present or potential hazard to human health, but which tend to have more localized impacts than criteria pollutants.

APPENDIX C

CARBON FOOTPRINT AND OPERATIONAL COST DATA

APPENDIX C
CARBON FOOTPRINT AND OPERATIONAL COST DATA

Electricity Usage Carbon Footprint

Table C-1. Electricity Usage Carbon Footprint—Calculations

Electricity Usage Scenario	Carbon Footprint Calculations		
	Electricity Usage[i]	x Emission Factor[ii]	= Carbon Emissions
Utility Usage—Existing Conditions			
Electricity (off-site supply)	21,307 MWh	0.35	7,457.5 mt
Utility Usage—Proposed Action			
Electricity (solar PV arrays)	941.5 MWh	0.00	<0.01 mt
Electricity (off-site supply)	20,365.5 MWh	0.35	7,127.9mt
Net Difference			
CO_2 Emissions (quantitative change)			–329.6 mt
CO_2 Emissions (percent change)			–4.4%
Equivalent Change in Emissions (number of automobiles)[iii]			–63

Sources: USEPA 2005, 2010; VA 2010a, 2010c.
Notes: mt = metric ton(s)
MWh = megawatts hour(s)
[i] electricity usage based on 2008 SFVAMC electricity usage (VA 2010c).
[ii] electricity emission factor from USEPA—Indirect Emissions from Purchased Electricity—Calculation Workbook (USEPA 2010).
[iii] equivalent automobile carbon emissions from USEPA—Emission Facts: Greenhouse Gas Emissions from a Typical Passenger Vehicle (USEPA 2005).

Electricity Usage Operational Cost

Table C-2. Operational Cost—Existing Conditions and Proposed Action

Electricity Usage Scenario	Electricity Usage or (Usage Reduction)[i]	Baseline Cost or (Savings)[ii]	Incentives (Savings)[iii]	Maintenance Costs[iv]	Total Cost or (Savings)
Baseline Conditions	21,307.0 MWh	$2,556,840	$0	$0	$2,556,840
Proposed Action Costs or (Savings)[v]	(941.5 MWh)	($112,980)	($48,958)	$19,973	($141,965)
Total	20,365.5 MWh				$2,414,875
Percent Difference	-4.4%				-5.6%

Sources: VA 2010a, 2010c.
Notes: MWh = megawatts hours
[i] electricity usage based on 2008 SFVAMC electricity usage (VA 2010c).
[ii] baseline cost or savings are based upon $120.00/MWh (VA 2010a).
[iii] incentives savings of $52.00/MWh would be available under existing regulatory conditions to the SFVAMC based upon anticipated annual solar PV system electricity output (VA 2010a).
[iv] maintenance costs have been estimated at approximately $0.000021/MWh for the solar PV system (VA 2010a).
[v] refer to *Table C-3* below for calculations of electricity usage, baseline cost, incentives savings, and maintenance costs under the Proposed Action (VA 2010a, 2010c).

Table C-3. Detailed Operational Cost Calculations—Proposed Action

Installation Location	Electricity (Usage Reduction)[i]	Baseline (Savings)[ii]	Incentives (Savings)[iii]	Maintenance Costs[iv]	Total (Savings)
Building 12	(105.6 MWh)	($12,672)	($5,491.20)	$2,239	($15,924.20)
Building 200	(180.8 MWh)	($21,696)	($9,401.60)	$3,835	($27,262.60)
Building 203	(269.3 MWh)	($32,316)	($14,003.60)	$5,714	($40,605.60)
Building 205	(70.4 MWh)	($8,448)	($3,660.80)	$1,493	($10,615.80)
Existing Garage (Building 209)	(315.4 MWh)	($37,848)	($16,400.80)	$6,692	($47,556.80)
Total Costs or (Savings)	(941.5 MWh)	($112,980)	($48,958)	$19,973	($141,965.00)

Source: VA 2010a.
Notes: MWh = megawatts hours
[i] electricity usage reduction based on installation site-specific estimates in the January 2010 *Solar PV Feasibility Study for the SFVAMC* (VA 2010a).
[ii] baseline savings are based upon $120.00/MWh (VA 2010a).
[iii] incentives savings of $52.00/MWh would be available under existing regulatory conditions to the SFVAMC based upon anticipated annual solar PV system electricity output (VA 2010a).
[iv] maintenance costs have been estimated at approximately $0.000021/MWh for the solar PV system (VA 2010a).

APPENDIX D

ENVIRONMENTAL JUSTICE DATA

APPENDIX D
ENVIRONMENTAL JUSTICE DATA

Table D-1. Racial Demographic Data

Population	SFVAMC Campus Vicinity[1]		City of San Francisco	
	Total	Percent	Total	Percent
Total Population	18,097	100.0%	808,976	100.0%
Minority Population[2]	10,096	55.8%	442,485	54.7%
Hispanic/Latino[3]	756	4.2%	114,303	14.1%
Asian-American	8,270	45.7%	251,121	31.0%
African-American	334	1.8%	48,268	6.0%
Native American/Alaska Native	27	0.1%	1,418	0.2%
Native Hawaiian/Pacific Islander	30	0.2%	3,665	0.5%
Other/Multi-Racial[4]	679	3.8%	23,710	0.2%
Non-Minority Population[5]	8,001	44.2%	366,491	45.3%

Sources: US Census Bureau 2000, 2008.
Notes: [1] The *SFVAMC Campus Vicinity* is comprised of San Francisco County Census Tracts 478, 479.01, 479.02, and 602.
[2] *Minorities* are persons classified by the US Census Bureau as Hispanic/Latino, Asian-American, African-American, Native American, Alaska Native, Native Hawaiian, Pacific Islander, Other Race, or Multi-Racial.
[3] *Hispanic/Latinos* are persons of any racial background with a Hispanic/Latino cultural heritage.
[4] *Other/Multi-Racial* includes persons of two or more races and persons of races not categorized above.
[5] *Non-Minority Population* includes persons who are White, European-American, and/or Middle Eastern.

Table D-2. Age Demographic Data

Population	SFVAMC Campus Vicinity[1]		City of San Francisco	
	Total	Percent	Total	Percent
Total Population	18,097	100.0%	808,976	100.0%
Population Under 18	2,547	14.1%	118,626	14.7%

Sources: US Census Bureau 2000, 2008.
Notes: [1] The *SFVAMC Campus Vicinity* is comprised of San Francisco County Census Tracts 478, 479.01, 479.02, and 602.

Table D-3. Income Demographic Data

Population	SFVAMC Campus Vicinity[1]		City of San Francisco	
	Total	Percent	Total	Percent
Total Population	18,065	100.0%	808,976	100.0%
Population Below Poverty Level	1,058	5.9%	88,987	11.0%

Sources: US Census Bureau 1999, 2008.
Notes: [1] The *SFVAMC Campus Vicinity* is comprised of San Francisco County Census Tracts 478, 479.01, 479.02, and 602.