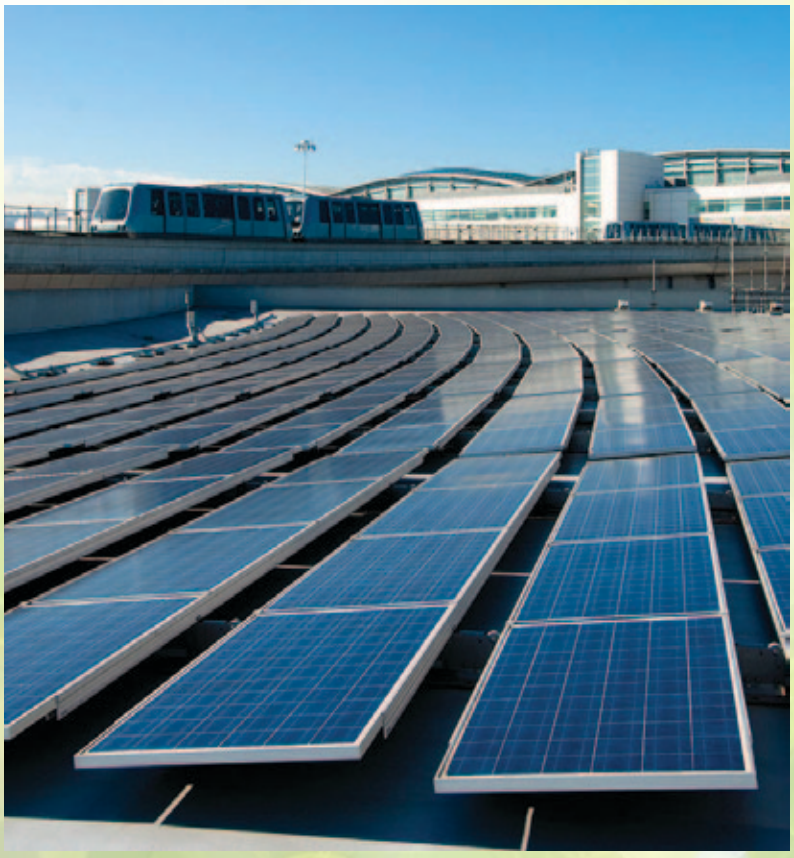
CALIFORNIA AIRPORTS COUNCIL

SERVING CALIFORNIA'S COMMERCIAL AIRPORTS

Model Environmental Practices for Public Use Airports

Full Report



SFO: Solar Air Train

First Edition - 2015

California Airports Council

Arcata/Eureka (ACV)
Kern County/Bakersfield Meadows Field (BFL)
Buchanan Field (CCR)
Burbank Bob Hope (BUR)
Carlsbad/McClellan/Palomar (CRQ)
Charles M. Schulz – Sonoma County (STS)
Chico Municipal (CIC)
Crescent City/Del Norte County (CEC)
Fresno Yosemite International (FAT)
Imperial County (IPL)
Inyokern (IYK)
John Wayne, Orange County (SNA)
South Lake Tahoe (TVL)
Long Beach (LGB)
Los Angeles International (LAX)
Mammoth Yosemite (MMH)
Merced Regional (MCE)
Modesto City – County (MOD)
Monterey Regional (MRY)
Norman Y. Mineta – San José International (SJC)
Oakland International (OAK)
Ontario International (ONT)
Palm Springs International (PSP)
Redding Municipal (RDD)
Sacramento International (SMF)
San Bernardino International (SBD)
San Diego International (SAN)
San Francisco International (SFO)
San Luis Obispo County Regional (SBP)
Santa Barbara Municipal (SBA)
Santa Maria Public (SMX)
Stockton Metropolitan (SCK)
Ventura County/Oxnard (OXR)
Visalia Municipal (VIS)

Model Environmental Practices

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Model Environmental Practices

Acknowledgements

This project is a result of the effort and dedication of the California Airports Council (CAC) staff and Environmental Working Group consisting of environmental directors, managers, coordinators, and practitioners from member airports. They meet regularly to share information about conservational programs, and work cooperatively on environmental issues that affect California airport operations. The Environmental Working Group currently comprises eleven airports.

CAC Environmental Working Group
Burbank Bob Hope (BUR)
Fresno Yosemite International (FAT)
John Wayne, Orange County (SNA)
Long Beach (LGB)
Los Angeles World Airports (LAWA)*
Norman Y. Mineta – San José International (SJC)
Oakland International (OAK)
Sacramento International (SMF)
San Diego International (SAN)
San Francisco International (SFO)

In California, small and non-hub airports comprise 60% of all commercial aviation airports. This project includes survey results from the following small and non-hub airports:

Small and non-hub airport respondents
Arcata/Eureka (ACV)
Merced Regional (MCE)
Monterey Regional (MRY)
Palm Springs International (PSP)
Santa Barbara Municipal (SBA)
San Bernardino International (SBD)
Stockton Metropolitan (SCK)
Ventura County/Oxnard (OXR)
Visalia Municipal (VIS)

* LAWA comprises Los Angeles International Airport (LAX) and Ontario International Airport (ONT)

Model Environmental Practices

Introduction

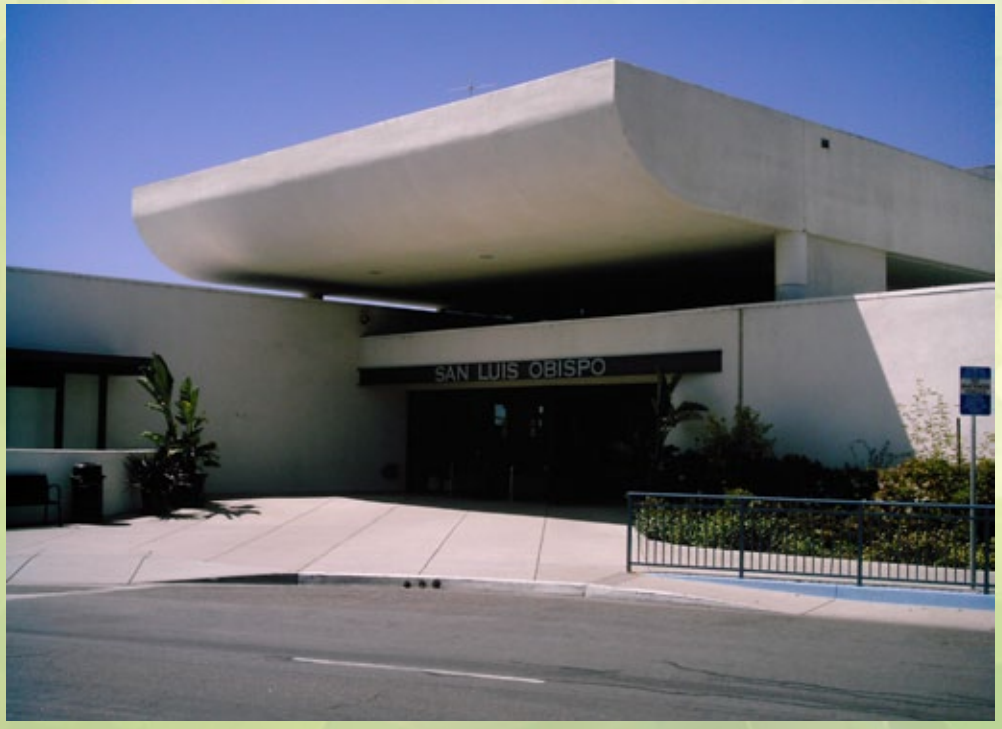
The California Airports Council (CAC) comprises the 34 commercial service airports in the state, collectively accounting for over 13% of all commercial aviation activity within the nation according to Airports Council International — North America (ACI-NA). California airports are leaders in environmental protection practices and have advanced beyond required levels of regulatory compliance as the state of California has some of the most stringent environmental protection regulations in the country, and indeed the world.

The Full Report is intended to be used as an educational tool for airports both within and outside California, as well as others interested in learning about the best available environmental practices to date.

Model practices are outlined into four major categories: Air Quality, Renewable Energy and Efficiencies, Waste Management, and Water Quality. Each section of the report provides specific examples of goals and initiatives undertaken by various California airports.

LAX: Los Angeles International Airport

SBP: San Luis Obispo County Regional Airport



The scale and nature of individual airport initiatives is often distinguished by the size of aviation activity. Larger airports have instituted significant environmental management practices commensurate with the size and scope of operations, while medium and smaller airports have instituted very effective environmental stewardship practices relative to their size and proportionately smaller environmental impact.

This report categorizes the model practices of California airports by size of operation. Size is defined as the percentage of total enplaned passengers relative to all commercial airports in the United States.* Enplanements identify the number of passengers boarding aircraft at each airport on an annual basis.

* Hub size defined per Interstate Air Transportation Definitions 49 U.S.C. § 47102

SFO: San Francisco International Airport

SAN: The Green Build

Large Hub: At least 1.0% of total passenger boardings in the United States

Los Angeles International Airport (LAX)
San Francisco International Airport (SFO)
San Diego International Airport (SAN)

SJC: Terminal Design Maximizes Natural Light

Medium Hub: At least 0.25% but less than 1.0% of total passenger boardings in the United States

Burbank Bob Hope Airport (BUR)
John Wayne Airport, Orange County (SNA)
Norman Y. Mineta-San José International Airport (SJC)
Oakland International Airport (OAK)
Ontario International Airport (ONT)
Sacramento International Airport (SMF)

Small Hub: At least 0.05% but less than 0.25% of total passenger boardings in the United States

Fresno Yosemite International Airport (FAT)
Long Beach Airport (LGB)
Palm Springs International Airport (PSP)
Santa Barbara Municipal Airport (SBA)

The elements of this project are based on a survey originally developed by ACI-NA, which sought to collect information on a variety of green initiatives. The CAC redistributed a modified format of the ACI-NA survey to California airports illustrating ongoing environmental initiatives in the state. As new environmental technologies and performance methodologies are implemented, the intent is to update this document to reflect practices as necessary.

FAT: Terminal Features Sequoia Trees to Promote Natural Environment

STS: Terminal Interior with West Windows Allowing Natural Light

Non-Hub: Less than 0.05% of total passenger boardings in the United States

Arcata/Eureka Airport (ACV)
Buchanan Field Airport (CCR)
Carlsbad/McClellan/Palomar Airport (CRQ)
Charles M. Schulz-Sonoma County Airport (STS)
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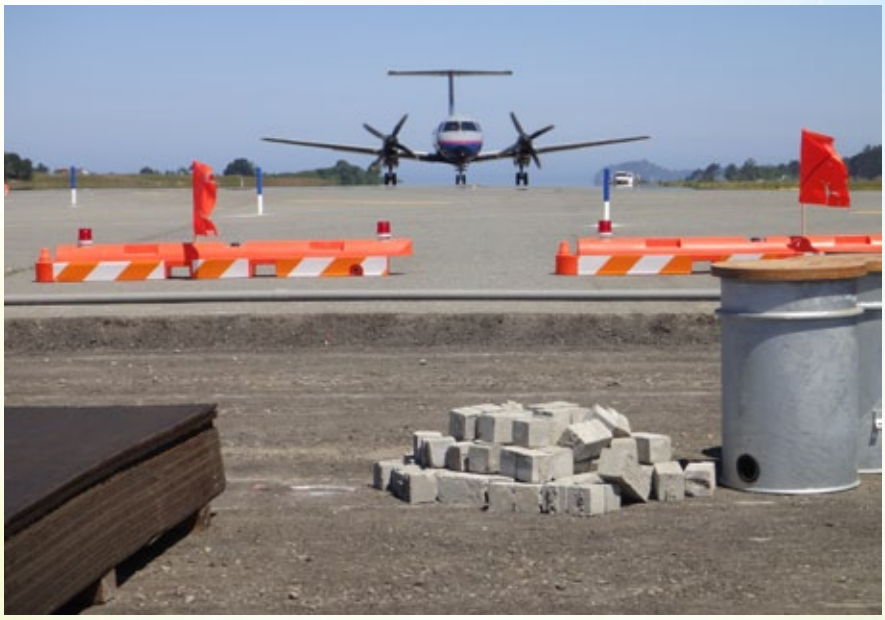
Model Environmental Practices

Air Quality

The Federal Aviation Administration (FAA), United States Environmental Protection Agency (U.S.–EPA), and International Civil Aviation Organization (ICAO) research and regulate emissions nationally and internationally. Airports, airlines, and aircraft manufacturers must abide by rigorous standards and regulations set by these agencies to maintain operations in the United States.



ACV: Arcata/Eureka Airport

To keep emissions within the thresholds of the U.S.–EPA's National Ambiant Air Quality Standards (NAAQS)*, airports have invested in a variety of technologies and equipment to minimize the production of harmful emissions. The six major emittants are carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), sulfure dioxide (SO_2), and particle pollution ($PM_{2.5-10}$).

The breadth of aviation activity at airports results in emissions from a variety of sources, some of which are directly controlled by the airport, while others require the cooperation of airport tenants.

To reduce emissions from airside operations, it has become common for airports to provide electricity and pre-conditioned air to aircraft while parked at gates. A number of airports have also built alternative fuel infrastructure on-site for tenant use of electrified ground support equipment (GSE) such as belt loaders and aircraft tug vehicles.

Another avenue for emission reduction is through landside operations involving the transportation of travelers to and from airport property. Many airports offer shuttles and taxis operating from alternative fuels, and in some cases, the airport has created a link to local transit stations via rail. Some airports also provide free electric vehicle (EV) charging stations to further encourage tenant and public use of low-emission alternatives.

The following section provides examples of air quality initiatives undertaken by California airports.

OAK: Airport BART Connector

* The National Ambiant Air Quality Standards are regulated per Title 40, Code of Federal Regulations, Part 50

Emissions Reduction Recommendations

- **Zero and Low-Emission Airport Vehicles**
  Purchase and/or conversion of airport-owned vehicles to low-emission alternatives such as compressed natural gas (CNG), liquefied natural gas (LNG), electric, propane, and hydrogen.

- **Zero and Low-Emission Ground Support Equipment**
  Purchase and/or conversion of ground support equipment to alternative fuels such as CNG, LNG, electric, propane, and hydrogen.

- **Zero and Low-Emission Vehicle Infrastructure**
  Installation of zero and low-emission vehicle support infrastructure such as electric vehicle (EV) charging stations and CNG refueling stations.

- **Reduced-Fee and/or Parking Incentives for Low-Emission Vehicles**
  Availability of incentives and/or reduced-fee parking for low-emission passenger vehicles.

- **Emission Reduction at Gates**
  Availability of 400 hertz (Hz) power, 28 volt (v) direct current (DC) power, pre-conditioned air (PCA), and hydrant fueling.

- **Carbon Footprint Reduction**
  Inventory of greenhouse gas emission reduction and increased energy efficiency, including the use of natural gas co-generation power plants.

I. Low-Emission Airport Vehicles: Conversion of airport-owned vehicles to low-emission vehicles.

Air Quality: Large Hubs

Fifty-seven percent of LAWA-owned vehicles are operated on alternative fuels. This includes all buses that transport passengers between the terminals and parking lots, maintenance vehicles, and vehicles used by employees. LAWA has over 650 vehicles in its alternative fuel fleet, making it the largest fleet among U.S. airports.

In 2000, SFO adopted a Clean Vehicle Policy to replace gasoline and diesel vehicles with vehicles powered by alternative fuels such as CNG and electricity. All on-airport passenger transportation is provided by the electric AirTrain people mover and by buses operating on landfill-derived CNG. Over 60% of the airport fleet runs on CNG, biodiesel, or electricity. By 2015, more than half of SFO's GSE will use clean power.

SAN possesses 44% (65) light-duty and 86% (26) heavy-duty vehicles that operate on CNG, electricity, biodiesel and/or hybrid power. SAN's goal is for 100% conversion of the airport-owned fleet to low-carbon fuels by 2015.

Air Quality: Medium Hubs

The OAK-owned motor pool fleet is 35% alternative fuel. The airport-owned parking lot and Airport Bay Area Rapid Transit (AirBART) shuttle bus fleet is 80% CNG.

SMF replaced 100% (38) of its diesel bus fleet with buses powered by CNG and has acquired hybrid vehicles, electric lifts and utility vehicles.

Twenty-Four SJC shuttle buses are currently using CNG. The airport also replaced 11 airport-owned gas and diesel service vehicles with new electric vehicles.

Approximately 8% of BUR-owned vehicle fleet is fueled with propane or electric. One of the 14 buses serving remote parking is CNG powered; the remaining 13 buses are equipped with diesel particulate traps which are designed to reduce exhaust particulate matter by 80%. The Authority will be replacing its entire fleet of buses with alternative-fueled vehicles within a year.

Air Quality: Small / Non-Hubs

FAT's goal is to convert 50% of airport-owned and operated vehicles to alternative fuel vehicles by 2020.

OAK: CNG Station

II. Ground Support Equipment (GSE): Conversion of ground support equipment to low-emission equipment.

Air Quality: Large Hubs

LAX has environmental commitments for zero or low emissions GSE conversions and already has nearly 1000 electric powered baggage tugs, belt loaders, carts, aircraft tractors, and other GSE.

SFO's comprehensive Clean Vehicle Policy includes airfield vehicles, and for over 20 years, airlines and contractors at SFO have used electric GSE. Today, over 400 all-electric and clean diesel vehicles are in service. Electric charging stations are located at all Terminal 2 gates and most Terminal 3 gates.

Air Quality: Medium Hubs

At OAK, 70% of all airline GSE has been converted to electric.

At SMF, 65% of Southwest and United Airlines GSE are electric or propane.

Southwest Airlines was awarded a grant to install electric GSE chargers from the California Air Resources Board. The airline is in the process of converting GSE serving the SJC airport to electric.

ONT airline-owned GSE is 100% electric.

Air Quality: Small / Non-Hubs

MCE has converted their runway, taxiway, and parking ramp sweeper to a low-emission alternative.

OXR has converted 25% of their operations fleet to hybrid vehicles.

LGB provides five electric charging stations on-site and airlines have purchased 25 electric vehicles for airfield operations.

OAK: GSE Charging Area

III. Low-Emission Access Vehicles: Implementation of incentive programs to encourage taxi, shuttle, limo and rental car companies to use low-emission vehicles.

Air Quality: Large Hubs

LAWA has an alternative fuel vehicle requirement for LAX contractors, lessees, and licensees with vehicles that are 8,500 pounds or greater.

Incentives at SFO include much lower trip fees for hotel courtesy shuttles, off-airport parking shuttles that use CNG and participate in a trip reduction program, maximum greenhouse gas emission thresholds for taxis, preferential website listings for green limo companies, and fast electric vehicle charges for all motorists. Shared-ride van operators are required to operate CNG or equivalent-emissions vehicles.

In 2011, SAN partnered with the California Center for Sustainable Energy, a local Toyota dealership, the San Diego Metropolitan Transit System, and taxi operators to bring the first green taxis to the airport. Through incentives including a grant-funded rebate program, low-interest financing, and vehicle maintenance packages, there are now over 60 hybrid taxis in operation and SAN anticipates further participation by taxi operators.

Air Quality: Medium Hubs

At OAK, ground transportation taxi and shuttle fleets serving the airport must be 50% alternative fuel and no older than ten years.

The SMF taxicab services agreement with Sacramento Independent Taxi Owners Association requires 35% of the fleet meet clean air vehicle standards.

At SJC, airport taxis and shuttles are required to make 25% of trips in alternative fuel vehicles.

All taxis that service SNA are powered by CNG, and most shuttles use alternative fuels.

At BUR, approximately 69% of airline ground support equipment is electric, propane or manually powered and only 31% uses fossil fuels. Battery charging stations are available for all fourteen gates. Several of the passenger loading ramps operated by the airlines are solar powered.

LAX: CNG Fueling Station

IV. Low-Emission Vehicle Infrastructure: Availibility of infrastructure for electric, CNG, propane, and hydrogen vehicles.

Air Quality: Large Hubs

LAX has a total of 38 EV charging stations for use by the general public in the central terminal area. Thirty chargers are J-1772 208v Level II style and eight are legacy small paddle induction charging stations. LAX has an LNG and CNG fueling facility for LAWA-owned buses and vehicles. A privately-owned and operated CNG station with a hydrogen pump is located adjacent to the airport and supports taxis, buses, shuttles, and alternative fuel vehicles owned by the public.

SFO has two large CNG stations on property with a total of 16 fast-fill hoses. Eighty parking stalls with Level 2 charging are available in short-term parking garages. Level I chargers have also been installed in long-term parking facilities and employee parking spots.

LAX: EV Charging

SFO: Charging Station

Air Quality: Medium Hubs

At OAK, 19 parking stalls with free Level I and II, J-1772 compatible EV charging stations are available to travelers. One legacy, small paddle inductive EV charging station has been retained. A public CNG refueling station on airport property, built in 2002, dispensed 421,480 gasoline gallon equivalent (GGE) in 2013. The development of a hydrogen fueling station is planned for 2015.

SMF operates a CNG fueling station that services the airport's bus fleet, shuttle companies, a refuse company and two school districts. Sixteen Level II EV charging stations have been installed in the parking garage and overflow lot. SMF also has six legacy small paddle induction EV charging stations.

Since 2002, SJC's CNG station has provided taxis, vans, SJC buses and the general public with CNG fuel. The station pumps the equivalent of over 600,000 GGE per year. SJC also offers EV charging stations in the Hourly Lot 2 (Terminal A) and the Hourly Lot 5 (Terminal B). Hourly Lot 2 has both inductive and conductive chargers with input power of 208-240v alternating current (AC). SJC has installed eight conductive Level II, J-1772 compatible charging stations in Hourly Lot 5.

OAK: CNG Station

Air Quality: Small / Non-Hubs

PSP offers seven EV charging stations funded by grants from ReConnect California, the Mobile Source Air Pollution Reduction Committee, and the local Air Quality Management District.

SJC: EV Chargers

V. Reduced-Fee and/or Parking Incentives for Low-Emission Passenger Vehicles: Availability of incentives and/or reduced-fee parking.

Air Quality: Large Hubs

LAWA offers an employee Vanpool Program that provides commuters a subsidy for using on-site vans. This Program saves over 8,000,000 commute miles and approximately 600,000 gallons of gasoline annually.

SFO's Transit First Policy promotes the use of public and private High Occupancy Vehicles (HOV) for traveling to the airport, increasing the use of shared-ride modes over driving alone. In 2013, forty-eight percent of SFO passengers arrived by shared-ride and hired driver ground transportation, the highest percentage in the country. Twelve percent commute by transit, a majority of which travel from San Francisco and the East Bay. SFO is exploring initiatives to increase the use of public transit by passengers.

Air Quality: Medium Hubs

OAK provides free EV charging stations and priority parking for plug-in electric vehicles (PEVs). The San Francisco Bay Area Rapid Transit District (BART) opened its extension to OAK in November 2014. It is a cable-driven people mover that will connect employees and passengers between the Airport and the BART system.

SMF provides free EV charging stations in the daily parking garage serving terminals A and B, and the daily lot.

Santa Clara Valley Tranport Authority (VTA) transit passes are provided to all tenant and City airport employees and SJC subsidizes free VTA shuttle bus service between terminals, Light Rail, and Caltrain.

BUR is intermodally connected to public transportation. It is served by two rail corridors, with an existing Metrolink and Amtrak station on the Ventura-LOSSAN corridor that is connected by an elevated moving walkway to the terminal. The moving walkway is part of the $120 million Burbank Airport Regional Intermodal Transportation Center (RITC) that links rail, buses, consolidated rental car facility, bicycles and airport terminal together. Based on 300,000 annual transactions, by relocating the Rental Car Service Facilities to the RITC, this removed approximately 600,000 annual vehicle trips on city streets. A new Metrolink station at BUR is being built on the Antelope Valley corridor, and California High Speed Rail is currently studying a station located at BUR along the Antelope Valley corridor.

Air Quality: Small / Non-Hubs

MRY has free EV charging stations available to travelers and employees.

PSP has publicly accessible CNG stations on airport property and free EV charging stations in parking garages.

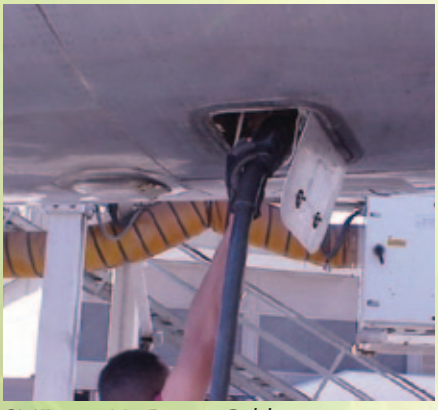
VI. Emission Reductions at Gates: Loading bridges equipped with pre-conditioned air, power, and fuel hydrants.

Air Quality: Large Hubs

All 133 gates at LAX have 400Hz power for use by airlines to replace or reduce the use of auxiliary power units on board aircraft. Eighty-six percent of the gates at LAX have PCA on the jet bridges. All terminals have fuel hydrants as well as many parking positions on cargo leaseholds.

At SFO, 400Hz power and PCA is provided at International Terminal gates, most gates at Boarding Areas B, C, E, and F, and all gates at the renovated Terminal 2.

SAN provides 400Hz power at all of its 42 loading bridges including all the new Green Build Project terminal gates recently completed and opened in 2013. Fourteen loading bridges are equipped with PCA, including the new bridges at Terminal 2. Power for the loading bridges was funded in part by a federal Voluntary Airport Low Emissions (VALE) grant in excess of $2 million.



SMF: 400Hz Power Cable

Air Quality: Small / Non-Hubs

SBA provides both 400Hz power and PCA at terminal gates for aircraft.

LGB has installed PCA and 400Hz power at each aircraft parking position.

Air Quality: Medium Hubs

SNA has PCA and 400Hz power on all jet bridge aircraft gates in the Thomas F. Riley Terminal.

SMF installed 400Hz power and PCA on all 28 jet bridges in 2003. Since the opening of Terminal B in 2011, there are now 31 jet bridges at SMF. All are equipped with 400Hz power and PCA. Seven jet bridges at Central Terminal B are also equipped with 28v DC for use by regional jets.

SJC was the first airport in the western U.S. to be awarded a VALE grant by the FAA in 2009. The $4.6 million grant was used to retrofit all 28 gates with PCA and 400Hz power to reduce airline engine use while parked at the gate.

ONT features 400Hz power and PCA at all gates.

All fourteen gates at BUR have grid power available for airline plug-in use for 400Hz and PCA.

OAK has PCA installed at all gates. The bridge power management systems installed on some gates allow electric GSE to be charged from bridge power supply when the bridge is not in use. In addition, OAK has 400Hz power available at all gates and remote parking areas, and an airport-wide fuel hydrant system in place since 1983.

VII. Carbon Footprint Reductions: Inventory of greenhouse gas emissions.

Air Quality: Large Hubs

LAX emits about 46,000 tons of carbon in its operation of the central utility plant, boilers, emergency generators, and qualifying mobile sources. Carbon reductions are achieved through reduced fuel usage in airport operations including airfield design efficiency, availability of ground power and PCA for aircraft, and improvements in emission and efficiency for the central utility plant.

SFO continues to reduce its carbon emissions by striving to reach their goal of 25% reduction from 1990 baseline GHG emissions. They plan to achieve this goal by reducing emissions from airport-controlled operations, increasing the solid waste recycling rate to 80% by 2015 to conserve resources and offset GHG emissions, increase the use of renewable sources of energy, and consider the risks of changing climatic conditions in airport planning and operational decision-making.

Air Quality: Medium Hubs

OAK and ONT completed separate GHG Emission Inventories in 2009 to determine their baseline emissions and reduction goals.

SMF opened an on-site aircraft fuel facility, eliminating 8,000 diesel-powered tanker truck trips per year and reducing vehicle miles traveled by 254,775.

SJC updated their fuel farm in 2009 to mitigate emissions to the environment. The fuel farm, consisting of above ground fuel storage tanks, was installed on-site to reduce the number of vehicles needed to transport fuel to the airport.

Air Quality: Small / Non-Hubs

FAT completed an inventory of GHG emissions of airport-owned and operated sources as part of the Airport's Sustainability Management Plan. The analysis demonstrated actual GHG emissions in 2010 were 28% below 1990 levels due largely to installation of the airport's solar farm and boarding gate electrification.

OAK: Preconditioned Air

Model Environmental Practices

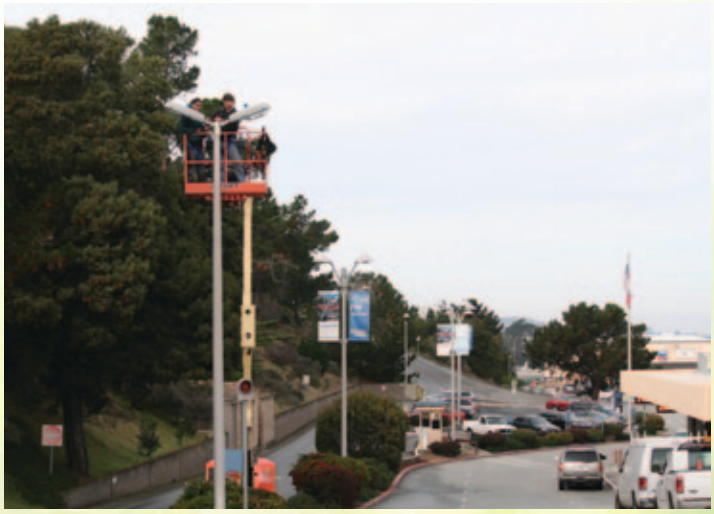
Renewable Energy and Efficiency

California commercial airports are among industry leaders in energy efficiency. Airports have implemented a variety of new technologies and sustainable practices to reduce carbon emissions while increasing performance. The California Energy Commission's Building Energy Efficiency Program* sets forth minimum energy efficiency standards for new construction and building renovation projects. Several airport facilities have exceeded Title 24 requirements by following the California Green Building Standards Code or Leadership in Energy and Environmental Design (LEED) principles. Recent California airport expansions and renovations have achieved LEED Silver or Gold designations for efficient design and construction practices.

Airports are increasingly turning to cleaner fuel sources and renewable energy generation, such as greater use of solar photovoltaic panels. Many airports also purchase renewable energy including hydroelectric, wind-generated, solar-generated, and geothermal energy. Some airports also have on-site power generation facilities, boosting reliability of power and reducing demands on local utility providers.

The following section outlines various steps taken by California airports to maximize energy efficiency.

*California Code of Regulations, Title 24



MRY: Energy Efficient Lighting

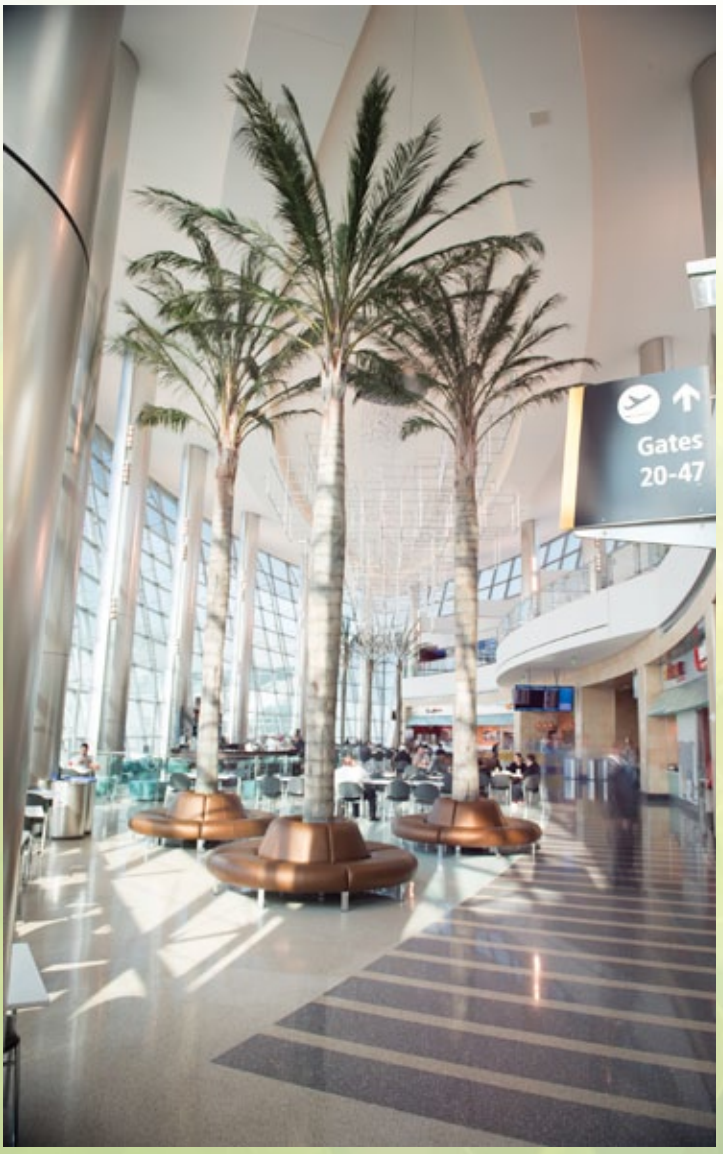
OXR: LED Airfield Lighting

Energy Efficiency Recommendations

- **Lighting and Efficient Building Systems**
  Installation of LEDs and maximization of windows for natural lighting.

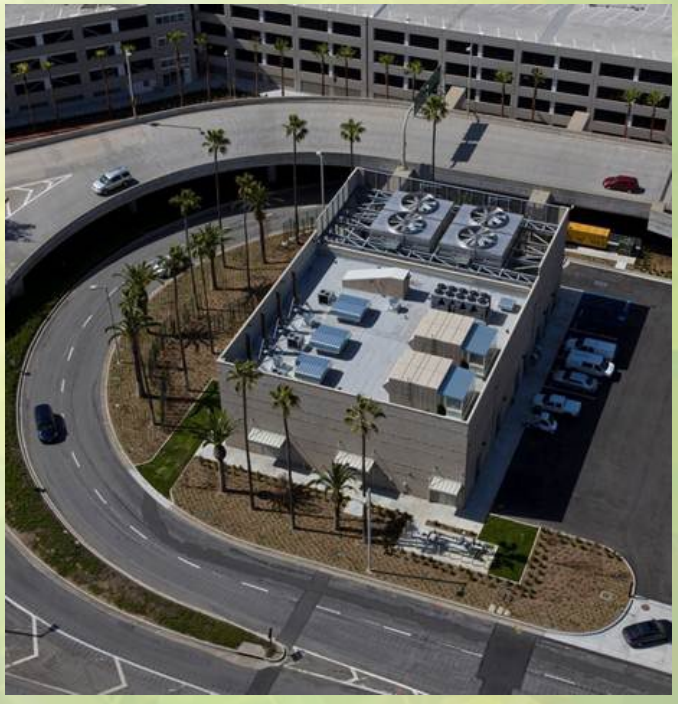
- **Renewable Energy Generation and Usage**
  Generation of land-based and rooftop solar energy on- and off-airport.

- **On-airport Power Generation Central Utility Plants**
  Use of best available technology to increase efficiency while reducing emissions and carbon footprint.



SAN: Large Windows to Maximize Natural Lighting

RDD: Solar Panels



SNA: On-Airport Central Utility Plant

I. Lighting and Efficient Building Systems: Installation of LED lighting.

Energy Efficiency: Large Hubs

LAX replaced lighting throughout the airport with energy-efficient bulbs and fixtures. The new Tom Bradley International Terminal has achieved LEED Silver certification and features advanced energy management strategies. The new Aircraft Rescue and Firefighting Facility (ARFF) achieved a LEED Gold rating in 2011.

SFO has completed over 60 projects since 1998 to replace legacy lighting fixtures across the airport with new energy-efficient lighting fixtures, such as LED roadway lighting and more efficient terminal lighting, providing the passenger an improved environment as well as reducing energy consumption. Lighting improvement projects have saved 10,938 megawatt hours anually, enough energy savings to power approximately 1,564 California households each year.

SAN has installed energy-efficient lighting in all the airport's operational areas, resulting in annual energy savings in excess of 2.3 million kilowatt hours. That's enough to power 300 homes for one year.

Energy Efficiency: Medium Hubs

Terminal C at SNA has LED lighting throughout the concourse. The airport is also in the process of completing plans to upgrade and install LED lighting in Terminals A and B.

OAK has LED taxiway lighting, and retrofitted fluorescent bulbs sized from T12 to T8 in terminal areas. The airport also uses a lighter colored roofing material to reduce the amount of heat absorbed during the day.

BUR has installed LED taxiway lighting.

In 2014, SMF installed LED lighting throughout the parking garage resulting in an annual reduction of 1.7 million kilowatts of energy.

Energy Efficiency: Small / Non-Hubs

FAT's goals are to reduce electrical usage by 26% and natural gas use by 15% by 2020. A 26% reduction in electrical consumption and expansion of the airport solar panel installation will make it possible to meet 100% of the airport's electrical needs from a renewable source.

MRY's Airport Energy Lighting Program retrofitted all of the parking areas and airfield ramp lighting at the airport with energy-efficient induction lights. In some of the parking areas, a lighting solution was chosen that increases safety while optimizing energy savings. Inefficient lighting fixtures were replaced with EverLast® Bi-Level Induction luminaires. Each fixture is equipped with a Lumewave, Inc. wireless controller and an occupancy sensor that allows the installation to operate as a system that can determine an occupant's direction of travel. These controls are combined with dimmable induction lighting to reduce total energy use when no movement is detected in that area.

MCE has installed a photoelectric sensor to control runway and taxiway lighting at the airport and minimize use of lighting during daylight, visual flight rule conditions. Lighting can be activated by the pilot by tuning into the Common Traffic Advisory Frequency (CTAF) and clicking the microphone.

II. Renewable Energy: consumption.

Energy Efficiency: Large Hubs

Nearly 23% of LAX's electricity was purchased in 2010 as renewable power through its municipal utility, the Los Angeles Department of Water and Power. LAX voluntarily continues to purchase green power

Since 2012, 100% of the electricity supplied to SFO has been generated from renewable sources.

Energy Efficiency: Medium Hubs

OAK has a 756 kilowatt solar panel installation. OAK's largest tenant, FedEx, has a 904 kilowatt rooftop solar panel and natural gas fuel cells. The airport has an Energy Innovation Study underway to characterize existing conditions, opportunities for the future, and develop a comprehensive energy policy.

At SJC, green power, defined as solar, wind, geothermal, biogas, biomass, and low-impact small hydroelectric by the U.S.-EPA, was purchased for Terminal B operation. Seventy percent of power purchased for Terminal B will come from green power sources offsetting 18,811,996 pounds of CO_2 over two years.

BUR is partnering with the City of Burbank to install approximately one megawatt of solar power on the roof of the Regional Intermodal Transportation Center.

Energy Efficiency: Small / Non-Hubs

FAT obtains over 74% of airport electricity from an on-airport solar panel installation, the second largest airport solar farm in the nation with 11,700 solar panels on 21.5 acres of land. The goal is to expand solar generation and energy conservation efforts so that 100% of the airport's electrical needs will be met by switching to solar power by 2020.

SMX uses solar power to light their on-site oil dump station.

Since 2006 at VIS, a 171-panel solar power system has been in operation generating nearly 60,000 kilowatt-hours of electricity annually. The system generates electricity during daylight hours, which is channeled back into Southern California Edison's grid and causes the airport's electricity meter to run backwards.

RDD installed a one megawatt solar facility in 2011 which was designed to offset 98% of its terminal and airfield lighting thereby reducing carbon emissions by 22,870 tons over 25 years.

CRQ uses solar taxiway lights and solar parking facility lights.

III. On-airport Power Generation Central Utility Plants: Use of best available technology to increase efficiency and reduce carbon footprint.

Energy Efficiency: Large Hubs

LAX's new central utility plant generates eight megawatts of power and is a co-generation facility used to heat and cool the terminals. The new central utility plant will feature a chilled water storage system that will cool water during off-peak hours when electricity demand is higher.

SFO has replaced all of its four hot water boilers with the latest and most efficient boiler models that meet the new Bay Area Air Quality Management District's emission reduction requirements.

Energy Efficiency: Medium Hubs

SNA utilizes a co-generation power plant to supply 1,800 tons of refrigeration capacity and support the airports chilled water demand.

At OAK, the new central utility plant design uses LEED principles and yields more efficient performance.

SMF uses a co-generation facility to provide one megawatt of energy while also cooling the airport through a waste-heat absorption chiller.

SJC's central plant was upgraded with an optimum energy heating, ventilation, and air-conditioning (HVAC) system. The new system saved the airport more than 1.2 million kilowatt-hours of electricity last year, preventing more than 1.3 million pounds of carbon dioxide from being released into the atmosphere.

SNA: Co-generation Power Plant

Energy Efficiency: Small / Non-Hubs

ACV uses "green" roofing material which absorbs heat in the winter and prevents the terminal from overheating during the summer.

RDD has a rooftop Ice Bear Unit. Typically, electricity generation is cleaner and less expensive at night time. The Ice Bear Unit will store energy at night to provide cooling to the building during peak daytime hours.

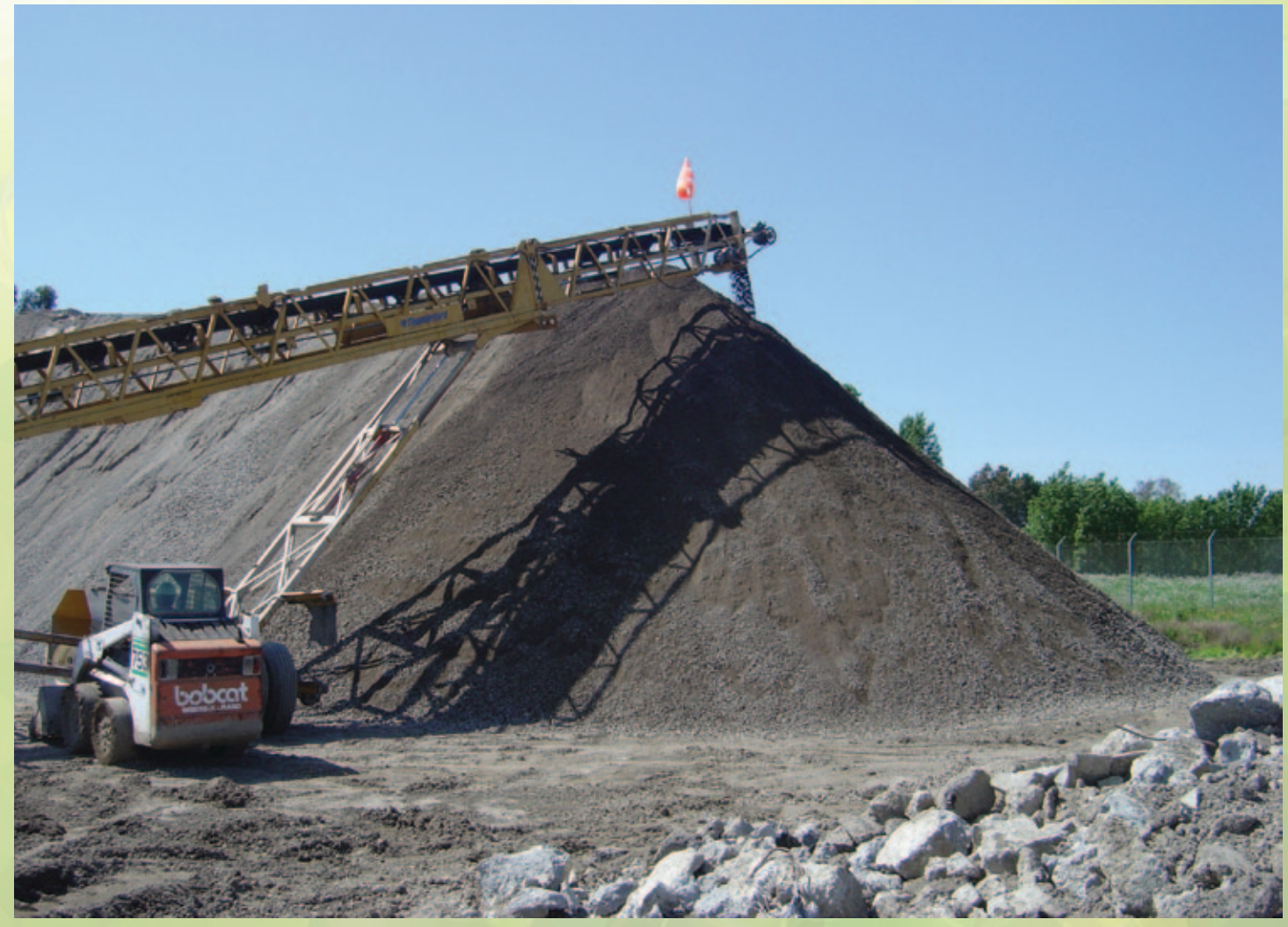
Model Environmental Practices

Waste Management

In the area of waste management, California airports again demonstrate effective and efficient practices that provide significant environmental benefits. Nearly all of California's commercial airports have terminal, airline and tenant waste management programs. Many airports also require recycling of construction and demolition materials for airport infrastructure construction projects. Large and medium hub airports typically have expansive composting and recycling programs in place, considerably minimizing waste at airports. Some airports now require compostable eating utensils to be used by airport food concessionaires. Most small and non-hub airports provide general waste and recycle bins in the passenger terminals.

The Waste Management section of the report outlines many of the practices implemented at California airports.

OAK: Stockpiled Asphalt, Concrete, and Soil Blended to Create Material for Airport Pavement



Waste Management Recommendations

- **Solid Waste Reduction and Recycling**
  Implementation of terminal, airline and tenant recycling programs.

- **Hazardous Materials**
  Substitution of less toxic chemicals in many operations, including firefighting foam, herbicides, fertilizers, and insecticides.

- **Composting and Recycling Construction and Demolition Debris**
  On-site preparation of recyclable debris for reuse, removal or recycling.

- **Hazardous Waste Generation and Disposal**
  Implementation of best management practices based on state and federal requirements.

LAX: Recycling Bins

RDD: Recycled Construction Materials

I. Solid Waste Reduction and Recycling: Implementation of terminal, airline and tenant recycling programs.

Waste Management: Large Hubs

In 1990, LAX implemented an extensive recycling program. The program recycles paper, plastic, glass, metal, wood, demolition debris, textiles, e-waste, food and green waste. LAX is committed to achieving a 70% diversion rate by 2015.

SFO has increased its solid waste recycling rate from 51% in 2002 to 77% in 2012. SFO continues to recycle over 90% of its construction and demolition waste. Practices include solid waste reduction, composting, material use reduction, waste separation, and construction and demolition waste recycling.

Waste Management: Medium Hubs

SNA reused 95% of demolition materials for roadway base in other county projects during the construction of Terminal C. SNA achieved a diversion rate of 77% for all waste material during 2013.

OAK expanded its waste reduction and recycling program to include composting in 2003. In 2008, OAK was the first airport in the country to install trash, recycling and composting chute rooms from the passenger terminal area to facilitate recycling. OAK's Foreign Object Debris (FOD) program for airfield tenants includes free annual disposal of e-waste, pallets and bulky waste. OAK's current diversion rate is 35%, which in 2013 prevented 344 tons of recycling and 152 tons of kitchen scraps from going to landfill. OAK is working towards the City of Oakland's goal of Zero Waste by 2020.

ONT implemented an ongoing airport recycling program in 2000. The average diversion rate has been 59% with an ultimate goal of 70% overall by 2015.

In 2007, the City of San José adopted the Green Vision, a 15-year plan for sustainability which focuses on environmental stewardship. As a result of this effort, SJC is seeking to achieve zero waste by 2022. Currently, waste and composting programs at the airport result in the diversion of over 85% of waste from landfill trash.

Waste Management: Small / Non-Hubs

RDD partners with the local wastewater utility for the integration, or recycling,of bio solids into airport property leased for farming. The farmer tenant benefits by saving the cost of fertilizer for non-human consumption crops. The wastewater utility benefits through direct savings for transportation costs, land fill fees and related emissions for the local sanitary district.

OXR has a general recycling program in place. The airport also has a Used Oil Collection Program providing pilots and aircraft owners an opportunity to safely dispose of waste oil and filters.

II. Hazardous Materials: Use of environmentally-friendly chemicals such as firefighting foam, landscaping herbicides, fertilizers and insecticides.

Waste Management: Large Hubs

LAX has an integrated pest management program that includes environmentally friendly herbicide use to control non-native plants.

SFO has implemented programs to identify and abate asbestos-containing materials and lead-based paint, and to reduce the usage of pesticides, insecticides and herbicides. With the use of alternative, less toxic methods, SFO reduced the use of pesticides and herbicides by approximately 82% between 1996 and 2001.

Waste Management: Medium Hubs

OAK encourages Integrated Pest Management techniques, but allows judicial use of environmentally-friendly herbicides, fertilizers and insecticides by tenants and contractors.

Even when using less toxic pesticides, SMF does not apply the chemicals before, during or immediately after a rain storm. SMF also uses bark and/or hardscapes to reduce weed growth.

Waste Management: Small / Non-Hubs

PSP plans to replace approximately 80% of turf grass with desert tolerant landscaping to reduce the amount of water, fertilizers and pesticides required to maintain the property.

SFO: Xeriscaping

III. Composting, Construction and Demolition Debris

Waste Management: Large Hubs

Since 2007, LAX has performed extensive expansion and renovation of its facilities resulting in the generation of large amounts of construction and demolition debris. In 2010, LAX alone recycled close to 7,300 tons of debris. For recent projects, almost all concrete and asphalt materials were recycled.

Currently at SFO, food waste, along with other biodegradable materials are transferred for off-site composting. SFO also requires the use of biodegradable tableware, plates, and containers by food vendors in all new leases and lease renewals. SFO has consistently achieved over 90% recycling on construction and demolition waste.

In 2010, SAN received its third consecutive "Recycler of the Year" award from the City of San Diego and the fifth overall award. The Airport's single stream recycling program allows all recyclable material to be collected in the same container. The Airport placed a total of 50 recycling bins throughout the airport terminals. This effort directly contributed to an increase in the amount of waste product recycled at the airport from 107 tons in 2002 to over 250 tons in 2003.

Waste Management: Medium Hubs

OAK's award-winning Materials Management Program recycles concrete, asphalt and soil from construction projects, resulting in less traffic, fewer emissions and less landfill waste. The Program has saved over $7.5 million in waste disposal costs and $1.3 million in material import costs. The Program has taken more than 425,000 tons of demolition materials, reclaimed 270,000 tons of reusable materials, saved 4,000 metric tons of GHG and removed 150,000 pounds of vehicle emissions from the air.

Over 50% of wood used in the construction of SJC's Terminal B was Forest Stewardship Council (FSC) Certified. All together, the recycled content of materials was 80% structural steel, 35% carpet, and 45% ceramic tile.

SMF recycles dead and decayed trees, mulching them for use as ground cover.

LAX: Recycling Cardboard

Waste Management: Small / Non-Hubs

During CRQ's runway renovation, old runway asphalt was ground and processed on-site to be reused on the new runway surface.

IV. Hazardous Waste Generation: Best management practices.

Waste Management: Large Hubs

LAX manages hazardous waste generated from its activities according to all applicable rules and regulations. Cleaner and solvent waste in the maintenance shops are removed by licensed waste haulers and transported for treatment, disposal, or recycling at off-site facilities. Products with less toxic characteristics are evaluated for use by staff based on their cost-effectiveness and utility.

Waste Management: Medium Hubs

ONT utilizes an Environmental Management System, based on a widely recognized environmental management standard developed by the International Organization for Standardization (ISO). The ISO 14001 is used to track hazardous waste use and disposal, and complies with all hazardous waste management rules and regulations.

OAK annually reports to tenants and staff on hazardous materials management, which includes storage, use, and disposal of certain products and chemicals. OAK performs inspections and updates Hazardous Waste Minimization plans annually.

Waste Management: Small / Non-Hubs

OXR conducts training for staff and tenants on spill prevention.

BUR: Hazardous Waste Management

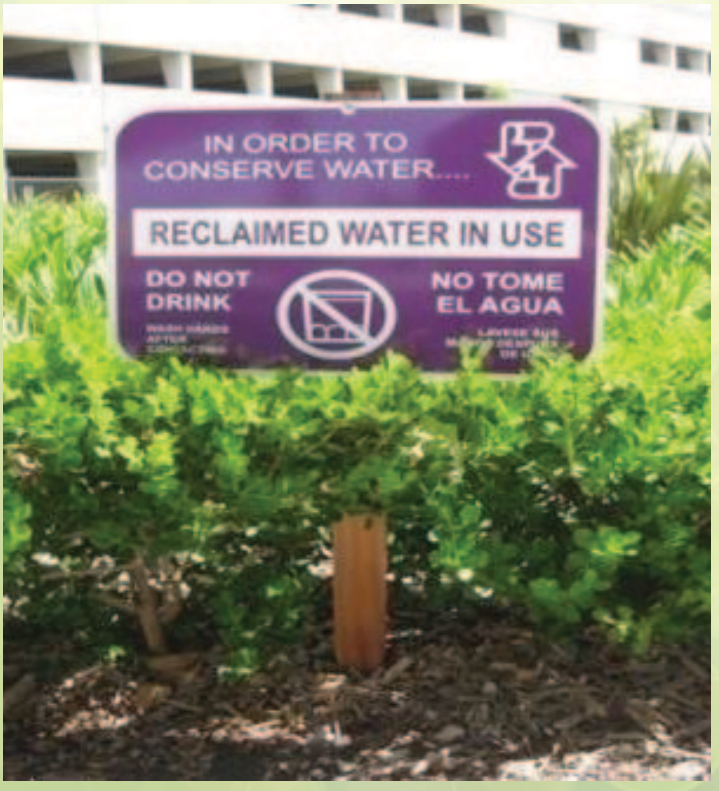
OXR: Oil Station

Model Environmental Practices

Water Quality and Conservation

SFO: Hydration Station

At California airports, the primary goal for water quality and consumption management is to ensure all stormwater that falls and collects on land is treated or filtered before it leaves airport property and fresh water consumption is minimized. Airports actively seek to ensure water entering storm drains and sewer systems meet all state and federal water quality standards for stormwater runoff. Airports are in compliance with all federal and state water quality laws and regulations, per the federal Clean Water Act, and the California counterpart, the Porter-Cologne Water Quality Act. Most airports, as well as other private and public sector facilities, must obtain general stormwater permits, of which there are three types: industrial, construction and municipal. Typically, airports possess industrial permits, which cover various aviation operation activities such as aircraft and vehicle maintenance, fueling, washing and de-icing. The permits guide treatment of stormwater at airports. Airports, as common-use facilities, often work with their tenants, including airlines and rental car companies, to ensure water quality and runoff standards are maintained.



BUR: Water Conservation

To minimize potable water consumption, airports often use recycled water for landscape watering and reserve fresh water for other uses. Also, in order to meet green building standards and obtain LEED certification, airports often strive to install low-flow toilets, automatic faucets, and no-flush fixtures, further reducing fresh water consumption.

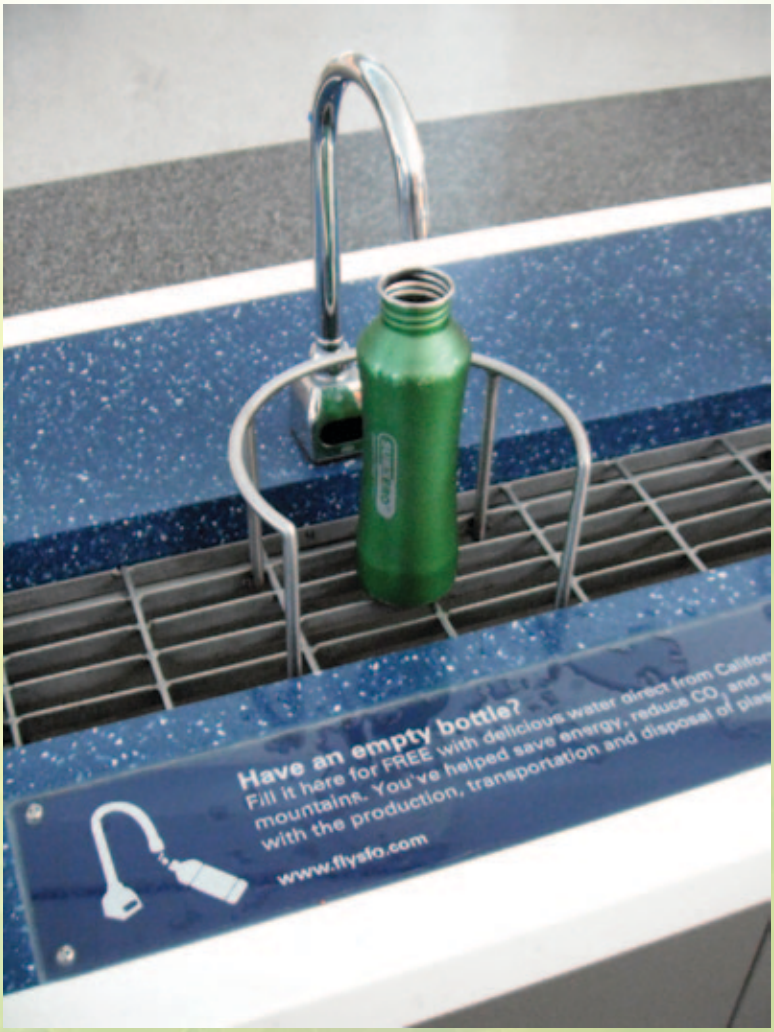
The Water Quality section further describes these activities.

Water Quality Recommendations

- **Water Conservation and Recycling**
  Reduction of water consumption by landscaping with drought tolerant plants, use of low-flow toilets, and motion activated fixtures.

- **Stormwater Runoff**
  Implementation of stormwater pollution prevention, monitoring programs, and best management practices that may include filtration and treatment systems.

OAK: LEED Motion Activated Faucet



SFO: Bottle Refill Station

I. Conservation and Water Recycling: Reduction of water consumption.

Water Quality: Large Hubs

LAX conserves 40 million gallons of potable water by using recycled water on 35% of the landscaped area. Computerized irrigation systems are used to water vegetation and LAX also intends to augment the area of drought tolerant plants. Low-flow water fixtures and ultra low-flow urinals have been installed in all LAX restrooms to reduce water usage.

To conserve water and enhance efficiency, SFO has implemented, and is expanding on, installation of low-flow restroom fixtures in all new buildings; installation of sensor-operated fixtures in public restrooms; elimination of unnecessary hydrant flushing; identification and replacement of aging/leaking water distribution pipes; and installation of drought resistant landscaping. SFO currently has plans to construct a recycled water treatment facility to reuse treated effluent from the wastewater treatment plant for terminal toilet flushing, irrigation and cooling tower makeup water.

SAN replaced all 1.5-gallon-per-flush urinals with 0.125-gallon-per-flush units, which now saves approximately 15 million gallons of water annually.

Water Quality: Medium Hubs

SMF utilizes low-flow fixtures in airport restrooms. SMF's Turf Management Program employs a variety of techniques (aeration, fertilization, higher mowing heights, etc.) to reduce irrigation water consumption. All rental car companies at SMF have reclamation systems for their car washes.

SJC's Terminal B utilizes recycled water for toilet flushing and landscaping with projections of 3.6 million gallons of recycled water to be used.

In 2010, SNA won the local water district award for being most "green" in their efforts to conserve water. SNA has also replaced standard urinals with ultra low-flow urinals.

Water Quality: Small / Non-Hubs

FAT has reduced water usage as follows: 1) require U.S.-EPA Water Sense Labeled fixtures for all upgrades and new construction, 2) require low-water use plants in new landscaping, 3) install landscape mulch in all new and existing plant beds, and 4) require climate-based controllers and high-efficiency irrigation systems in new landscape areas.

Throughout the terminal, PSP utilizes waterless urinals and low-flow water fixtures.

SBD has installed low-flow toilets in restrooms to reduce water consumption.

II. Stormwater Runoff: Stormwater pollution prevention and monitoring programs: filtration and treatment systems.*

Water Quality: Large Hubs

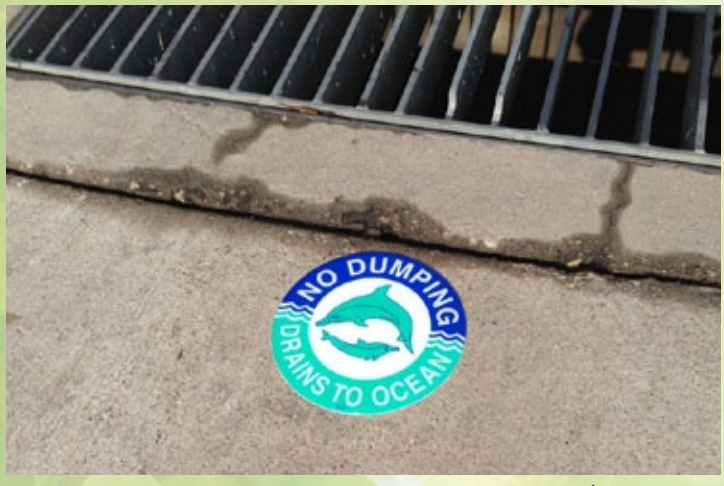
LAX has an active Stormwater Pollution Prevention program that reduces the amount of runoff pollution through best practices and engineered systems. The first flush of runoff from the major maintenance areas and the Central Terminal areas are captured in a detention basin for treatment.

At SFO, runoff from areas where industrial activities are located is diverted to four detention ponds with a combined capacity of 8.6 million gallons. SFO pumps the first flush of this runoff to the industrial wastewater treatment plant for treatment.

Water Quality: Medium Hubs

Since 1992, OAK has offered pollution prevention training to its tenants twice per year. Spill prevention procedures, stormwater monitoring, and emergency plans are implemented and enforced. OAK redesigned 60 acres of parking lots and rental car facilities, and five miles of roadway to remove oil, dirt and grease from stormwater by filtering it through grassy swales.

Approximately 35% of storm water inlets are filtered to capture hydrocarbons and other contaminants. BUR is planning to eventually filter all storm water inlets.



OXR: "No Dumping" Signs at Stormwater Drain Catch Basins

Water Quality: Small / Non-Hubs

PSP uses computerized irrigation systems to water the land owned by the airport.

SBD provides stormwater pollution prevention training to tenants.

VIS filters stormwater runoff to remove oil, dirt, and grease.

*All airports are required to monitor and manage stormwater pollution per the Clean Water Act - 33 U.S.C. §1251 et seq. (1972)

Model Environmental Practices

Conclusion

OAK: Stormwater Landscaping

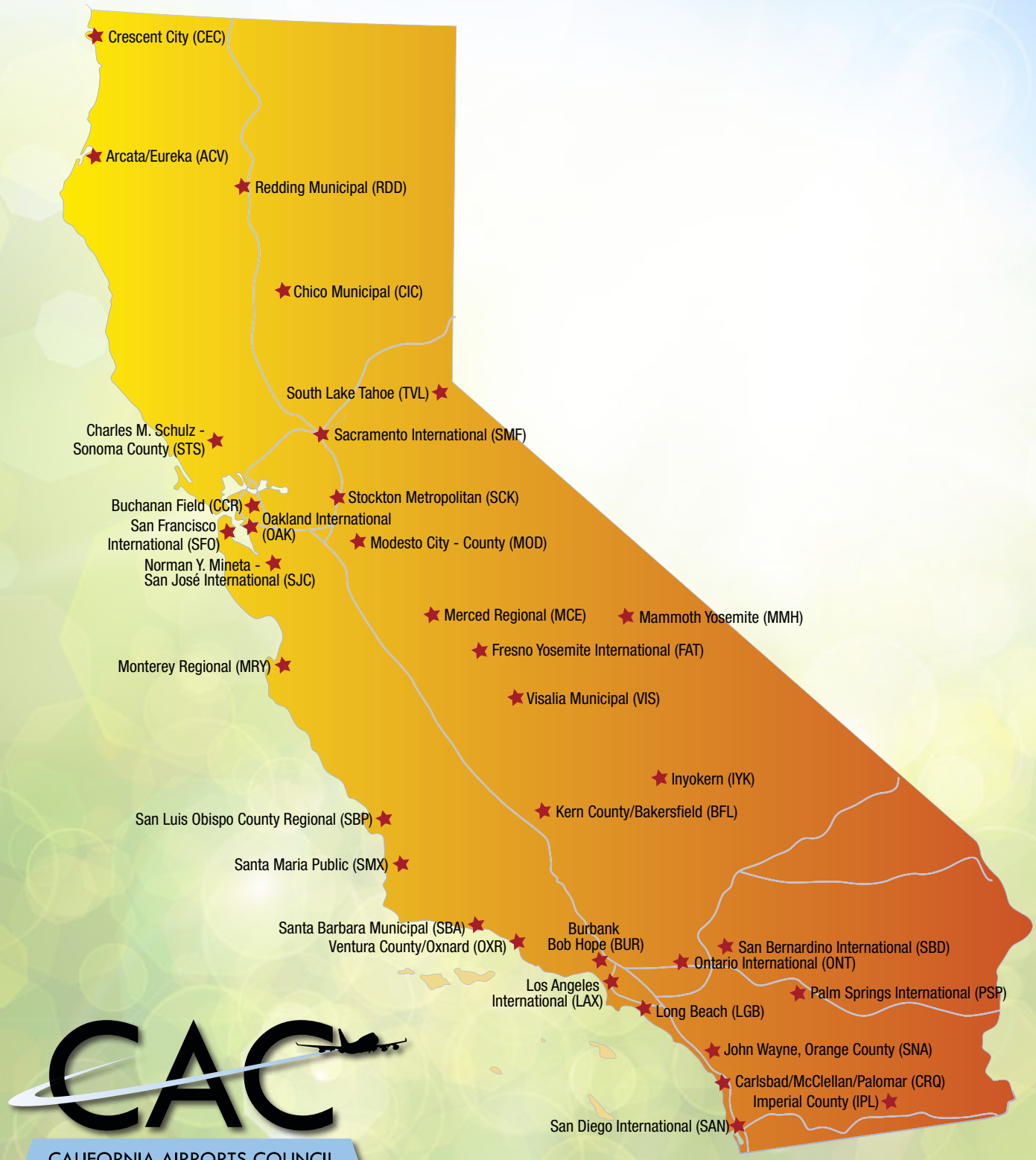
TVL: Airport Utilizes Porous Asphalt to Manage Storm Water Runoff

In this report, the California Airports Council has sought to outline the initiatives of airports to serve as responsible environmental stewards while taking proactive steps to improve environmental preservation. With the guidance and regulation of agencies such as the FAA, U.S.-EPA, and ICAO, California airports continue to act as world leaders in GHG emission reduction efforts. The practices outlined in this Full Report will serve as a model for airports and other public agencies seeking viable initiatives towards environmental protection.

For more information on the green efforts of California airports, please visit *www.calairportscouncil.org/going-green/*

Acronyms

AC	Alternating Current
ACI-NA	Airports Council International – North America
BART	Bay Area Rapid Transit
BEV	Battery-powered Electric Vehicles
CAC	California Airports Council
CGBS	California Green Building Standards
CNG	Compressed Natural Gas
CTAF	Common Traffic Advisory Frequency
EV	Electric Vehicle
FAA	Federal Aviation Administration
GGE	Gasoline Gallon Equivalent
GHG	Greenhouse Gas Emissions
GSE	Ground Support Equipment
HOV	High Occupancy Vehicles
ICAO	International Civil Aviation Organization
ISO	International Standards Organization
LED	Light Emitting Diode
LEED	Leadership in Energy and Environmental Design
LNG	Liquified Natural Gas
NAAQS	National Ambiant Air Quality Standards
PCA	Pre-conditioned Air
PEV	Plug-in Electric Vehicles
U.S.-EPA	United States Environmental Protection Agency
VALE	Voluntary Airport Low Emissions Program



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CALIFORNIA AIRPORTS COUNCIL

SERVING CALIFORNIA'S COMMERCIAL AIRPORTS

1510 14th Street, Sacramento, CA 95814
Ph: 916.553.4999 • Fax: 916.447.4947
calairportscouncil.org

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