

Ocean Climate Initiative Action Plan

Green Operations: Reducing Our Carbon Footprint

Introduction

The following chapter provides over 130 action plan strategies to reduce the green house gas emissions that result from the facilities and operations of Gulf of the Farallones National Marine Sanctuary. They are binned in five categories: Transportation Management, Energy Efficiency, Waste Management, Water Management, and Education and Outreach. Within each category a measurable target, specific actions, evaluation metrics, and potential partners are identified to the years 2015 and 2020. To complement this chapter, the sanctuary also completed energy, transportation, and waste audits, and derived an emissions inventory for the calendar year (see attached 2008 Emissions Inventory). These studies help to prioritize recommended actions, and provide an effective evaluation and education tool to sanctuary management. The scope of the document was defined to focus on all staff activities that occurred at the headquarters facility on Crissy Field in San Francisco, CA, and included employee commuting, all work-related travel including flights, and use of the Research Vessel *Fulmar*.

This chapter was developed by the Gulf of the Farallones National Marine Sanctuary Advisory Council's Green Operations Working Group, as part of the Office of National Marine Sanctuaries Blue Seas Green Communities Initiative. Participants included representatives from the San Francisco Department of Environment, Golden Gate National Recreation Area (landlord), Presidio Trust (utilities provider), a green architectural firm (LEED expert), and several members from the Advisory Council. Presented to the full Advisory Council in August 2009, the Council accepted the recommended strategies and forwarded them onto the sanctuary superintendent for adoption and promulgation to other sanctuary sites within the National Marine Sanctuary System.

I. Transportation Management

GOAL: Reduce green house gas emissions through green transportation choices.

Objective: Reduce per capita green house gas emissions generated from transportation 5% annually, or 25% by 2015 and 50% by 2020. Baseline year one data was derived using the National Park Service CLIP Tool (see Appendix I).

Strategy TM-1: Reduce CO₂ emissions from employee travel to and from workplace.

Activity 1.1: Encourage carpooling through employee incentives.

Activity 1.2: Encourage carpooling by designating two closest (and most visible) campus parking spots as HOV/Alternative Vehicle spaces.

Activity 1.3: Improve bike parking on campus

- a. Increase the number of spaces to hold eight bikes comfortably.
- b. Delineate the bike parking area.
- c. Encourage people to use the bike rack for parking, not storage of their bicycles.

Activity 1.4: Take advantage of federal transportation subsidy programs

Activity 1.5: Offer periodic bike repair clinics for employees.

Activity 1.6: If feasible, use the Commuter Check program to encourage employees to commute to work by public transportation.

Activity 1.7: If feasible, participate in the federal Qualified Bicycle Commuting Reimbursement, a new bicycle commuter tax provision that went into effect December 31, 2008.

Activity 1.8: Allow employees the option to telecommute at least one day per week.

Activity 1.9: Promote flexible work schedules to reduce commute times by avoiding the most heavily traveled hours.

Activity 1.10: Work with the Presidio Trust to have an around the park shuttle that goes in both directions.

Activity 1.11: Work with Presidio Trust on coordinating a vanpool or other public transportation options.

Activity 1.12: Participate in the Emergency Ride Home Program (www.sferh.org) to provide free emergency transportation from work to employees that use alternative commute modes (e.g. biking, walking, bus, train, carpool).

Strategy TM-2: Reduce CO₂ emissions from employee travel off-site (includes vehicle and airplane).

Activity 2.1: Require hybrid or alternative fuel vehicles when leasing new vehicles.

Activity 2.2: Always leave the "Econ" button on in the Hybrid.

Activity 2.3: Use the Hybrid vehicle over the van whenever possible.

Activity 2.4: Encourage phone or web conferencing when possible for meetings as opposed to air travel or long-distance driving.

Activity 2.5: Keep vehicles well maintained to prevent leaks and minimize emissions; encourage employees to do the same.

Activity 2.6: Install telecommunication equipment during campus renovation.

Activity 2.7: Offer alternative transportation resources to employees while at work, such as a bike, electric scooter, or the use of a ZipCar.

Strategy TM-3: Reduce CO₂ emissions from the research vessel *Fulmar*.

Activity 3.1: Use biodiesel fuel (currently there is none available in San Francisco Bay or Half Moon Bay). Staff will work with Pillar Point Harbor in Half Moon Bay to provide biodiesel.

Activity 3.2: Plan and execute *Fulmar* cruises to minimize transit times (e.g., work north to south, coordinate cruises with other local sanctuaries).

Activity 3.3: Consider alternative research methods, such as the use of NOAA Twin Otter aerial surveys to reduce the use of the *Fulmar*.

Strategy TM-4: Educate the public on how to reduce transportation CO₂ emissions at sanctuary visitor centers.

Activity 4.1: Provide visitors resources such as the PresidiGo transit map, Transit to Trails, and bus schedule. Add links to website to PresidiGo transit maps, 511.org and Transit to Trails.

Activity 4.2: Encourage carpooling, PresidiGo, biking, and public transportation, for groups coming to the Sanctuary Visitor Center on Crissy Field.

EVALUATION

1. Conduct and update transportation audit every year.
2. Conduct employee evaluation to assess the ease of commuting to the sanctuary offices, incentives to drive less, and success of transportation management to reduce CO₂ emissions.
3. Based on evaluation results develop additional strategies to reach emission reduction target.
4. Report accomplishments and needed actions annually to Sanctuary Advisory Council.

POTENTIAL PARTNERS

Presidio Trust, Regional Transportation Agencies, U.S. General Service Administration (GSA), San Francisco Department of the Environment, Pillar Point Harbor, Bay Area fuel docks

II. Energy Efficiency

GOAL: Reduce green house gas emissions through a reduction in energy demand and more efficient use.

Objective: Reduce energy intensity (energy use per square foot of building space) 3% annually or 15% by 2015 and 30% by 2020. Baseline year one data in kilowatt hours/year was derived using utility statements (see Appendix I).

Strategy EE-1: Install energy meters on sanctuary campus.

Activity 1.1: Install separate meters for gas, electricity and water usage.

Activity 1.2: Display metering data, such as smart meters in public places.

Strategy EE-2: Obtain LEED certification for sanctuary campus.

Activity 2.1: Strive for campus-wide LEED Gold Certification.

Strategy EE-3: Install efficient lighting in and around sanctuary campus

Activity 3.1: Display signs to remind employees to only turn on lights when needed.

Activity 3.2: Rearrange workspace to take advantage of areas with natural light and design for increased natural lighting when remodeling.

Activity 3.3: As current bulbs burn out, replace all light bulbs with compact fluorescents or LED.

Activity 3.4: Turn off any lights not in use. Install motion-sensor activated lights in the library, supply room, outreach pantry, and kitchen.

Activity 3.5: Display signs to remind employees to turn off lights, appliances, electronics, after use.

Activity 3.6: Turn off computer monitors when not in use. Work to update IT policy to schedule certain days computers can be turned off.

Activity 3.7: Install daylight sensors on outdoor lights.

Activity 3.8: Replace all T12 lamps and magnetic ballasts with T8 or T5 lamps, with premium efficiency electronic ballasts.

Activity 3.9: Replace all incandescent exit signs with an LED version.

Activity 3.10: Replace all halogen accent lighting to use the most efficient technologies- either IR (infrared) lamps or an LED version.

Strategy EE-4: Decrease carbon emissions from electronic equipment and appliances

Activity 4.1: Take advantage of software that helps computers run more efficiently.

Activity 4.2: Monitor plug loads and “vampire” loads.

Activity 4.3: Allow computers to be turned off when security checks are not in progress (schedule computers for security checks).

Activity 4.4: Turn all power strips not associated with a computer off when not in use. Turn power strips that are associated with a computer off when security checks are not in progress.

Activity 4.5: Turn all printers off at night and on weekends. Plug all electronics in the copy room into central power strips that can be turned off nights and weekends.

Activity 4.6: Use the standby mode on equipment (e.g., energy saver buttons on copiers).

Activity 4.7: Unplug appliances when not in use.

Activity 4.8: Purchase only ENERGY STAR qualified appliances.

Activity 4.9: Enable non-essential equipment to be turned off at one place by using a master switch. Investigate using a master timer.

Activity 4.10: Only purchase Smart Strips (to provide multiple plug outlets) that turn off after inactivity.

Activity 4.11: Assess the feasibility of using Smart Circuits. May be limited by federal government restrictions.

Strategy EE-5: Increase energy efficiency through rehabilitation, maintenance, and weatherization of HVAC (heating, ventilation, air conditioning).

Activity 5.1: Install a more efficient heating system.

Activity 5.2: Insulate all hot water pipes.

Activity 5.3: Evaluate the size of ducts, vents, fan/pump motors used in the buildings for air circulation and insulation. Check entire system each year for air leaks, duct sealing, clogs, and obstructions of air intake and vents.

Activity 5.4: Allow users to control building heat.

Activity 5.5: Clean permanent filters with mild detergents every two months (change replaceable filters every 2 months, only use if needed).

Activity 5.6: Monitor each energy bill for sudden rises in energy use.

Activity 5.7: Use weather stripping (weatherizing and caulking) to seal air gaps around doors and windows and keep a maintenance log.

Activity 5.8: Retrofit windows to double-paned, low-emission glass (currently not possible in accordance with historic building restrictions).

Activity 5.9: If purchasing new computers, buy EPEAT certified (www.EPEAT.net). If purchasing monitors, consider flat-screen LED monitors, which consume approximately 1/3 less energy than larger ray tube monitors.

Activity 5.10: Set thermostat to 76°F for cooling and 68°F for heating. Use timing devices to turn system down after hours. (*Note - No cooling currently required on campus.*)

Activity 5.11: Keep hot water heaters set to standard 125-130° F. Use tankless water heaters where possible.

Activity 5.12: Set refrigerator temperature between 38°F and 41°F and freezer between 10°F and 20°F.

Activity 5.13: Hire an engineer to design HVAC system for optimal efficiency and LEED certification. Recommission as required.

Strategy EE-6: Use renewable energy.

Activity 6.1: Work with the Presidio Trust to purchase energy from renewable sources for the campus.

Activity 6.2: Install onsite renewable energy generation such as solar and wind.

EVALUATION

1. Complete energy audits every year.
2. Complete San Francisco Green Business certification every three years.
3. Complete regularly scheduled HVAC and refrigeration system maintenance at least twice a year.
4. Based on energy audit results and as needed, develop additional strategies to increase energy efficiency.
5. Report accomplishments and any needed actions annually to Sanctuary Advisory Council.

POTENTIAL PARTNERS

San Francisco Department of the Environment, Golden Gate National Recreation Area, Presidio Trust, Pacific Gas and Electric Company, Department of Energy

III. Waste Management

GOAL: Reduce green house gas emissions through a reduction in solid waste.

Objective: Divert 95% of generated waste by volume from landfill by 2015 and 100% by 2020.

Strategy WM-1: Increase on-site recycling and composting.

Activity 1.1: Implement a campus-wide composting program. Compost all organics

including food and yard discards, soiled paper products, and compostable food containers.

Activity 1.2: Recycle all glass, plastic, and aluminum.

Activity 1.3: Ensure all batteries, cell phones, and ink cartridges are recycled. Provide clearly marked bins in the copy room. Return used ink cartridges, and drop other items off at local recycling centers.

Activity 1.4: Only supply rechargeable batteries and chargers.

Activity 1.5: Provide recycling bins for every room in the buildings (including all meeting areas).

Activity 1.6: Send FedEx Tyvek envelopes back to supplier to recycle.

Activity 1.7: Replace bin liner bags using the following hierarchy of preference: 1) garbage bags made from recycled content; 2) no liner for recycling bins, and recycled content transparent bags only when necessary; 3) BPI (Biodegradable Products Institute) compostable bags or no bag for compost collection.

Activity 1.8: Post lists of items that can be recycled and composted on bins.

Strategy WM-2: Decrease paper waste.

Activity 1.1: Recycle or reuse paper including cardboard (corrugated cardboard boxes), mixed paper (junk mail, scrap and colored paper), newspaper, office paper (white ledger, color paper, computer, large format and copier paper).

Activity 1.2: Designate a bin in the copy room to place re-usable scrap paper. Use this paper to make notepads.

Activity 1.3: Request to be removed from catalogs or other publications that are not used or if multiple copies are received.

Activity 1.4: Create all new laminated signs for the VC bathrooms (to give a cleaner look) and add a new sign that addresses paper consumption (e.g., these come for non-renewable resources, please use only what is needed, etc.).

Activity 1.5: Begin composting paper towels in the V.C. bathroom and any paper towels that get used in other bathrooms. Produce signage for this.

Activity 1.6: Install or place free-standing hand towel racks in every bathroom except the VC. Create a sign-up sheet for staff to rotate washing these towels and the kitchen towels every other week.

Activity 1.1: Default all computers to print double-sided. If this is not possible for all printers, make sure all employees know how to print double-sided and use printers with this capability when possible.

Activity 1.7: In the future, purchase only duplex capable printers.

Activity 1.8: Require janitorial paper supplied (toilet paper, tissues, and paper towels) to be made of 100% post consumer waste content.

Strategy WM-3: Decrease waste with re-usable products.

Activity 1.1: In the lunch/break room, replace any disposables with permanent ware (mugs, dishes, utensils, etc.) and use refillable containers for sugar, salt and pepper, etc. to avoid individual condiment packets.

Activity 1.2: Supply cloth napkins, towels, and cleaning rags throughout building.

Activity 1.3: Eliminate disposable plastic water bottles for employees and guests. Install a

water filtration system.

Activity 1.4: Monitor waste streams to identify additional source reduction strategies.

Strategy WM-4: Use environmentally friendly paper supplies.

Activity 1.1: Purchase copy, computer and fax paper with 50-100% post consumer waste content.

Activity 1.2: Purchase letterhead, envelopes and business cards with 50-100% post consumer waste.

Activity 1.3: Purchase large format or plotter paper with a minimum 30% recycled content, or higher recycled content if available.

Activity 1.4: Use unbleached and/or chlorine-free paper products (e.g. copy paper, paper towels, napkins, coffee filters).

Activity 1.5: Use a corrugated or recyclable board in place of foam core board.

Activity 1.6: Purchase folders or other paper products with recycled content.

Activity 1.7: Use only green product vendors.

Strategy WM-5: Reduce the use of toxic products.

Activity 1.1: Require that the janitorial crew only use environmentally friendly cleaning products.

Activity 1.2: Replace all aerosols with pump dispensers, if available.

Activity 1.4: Replace toxic permanent ink markers/pens with water-based ones.

Activity 1.5: Use low- or no-VOC paint products.

Activity 1.6: Use recycled or remanufactured laser and copier toner cartridges.

Activity 1.7: Use natural or low emission building materials, carpets, and furniture.

Activity 1.8: Conduct environmentally friendly landscape maintenance. Determine if pesticides are currently used.

Strategy WM-6: Conduct and promote green events and meetings.

Activity 1.1: Discourage the use of disposable products at meetings (such as single-use water bottles, plates, and utensils). Use only non-disposable or compostable items.

Activity 1.2: Write meeting agendas on the white board instead of printing copies. Also print one copy of the calendar at staff meetings for everyone to review or project on a screen during the meeting.

Activity 1.1: Develop a list of local green vendors and food purveyors.

Strategy WM-7: Implement green construction and demolition practices.

Activity 1.1: When conducting remodels: Use recycled content, refurbished, or salvaged materials such as building fixtures, ceramic tiles, drywall, insulation, concrete, composite lumber/wood, roofing, flooring, cabinets, ceiling tile, interior paneling, etc.).

Activity 1.2: Recycle all construction and demolition debris.

Activity 1.3: Dispose hazardous materials at approved locations.

EVALUATION

1. Conduct waste audits every year.
2. Based on waste audit results, and as needed, develop additional strategies to reduce waste.
3. Report accomplishments and any needed actions annually to Sanctuary Advisory Council.

POTENTIAL PARTNERS

San Francisco Department of the Environment, Golden Gate Disposal, California Conservation Corps

IV. Water Management

GOAL: Conserve water through efficient water use.

Objective: Reduce per capita water consumption 2% per year or 10% by 2015 and 20% by 2020.

Strategy WRM-1: Promote water conservation.

Activity 1.1: Review water bills and check water meters monthly for indications of leaks, spikes or other problems.

Activity 1.2: Check the property for leaks every 6 months. (Leaks in toilet tanks can be detected with leak detecting tablets, which may be available from the local water company.)

Activity 1.3: Ensure all toilets have a maximum flush volume of 1.6 gpf (gallon per flush) or less. When purchasing new fixtures, install High Efficiency Toilets (HETs). HETs use 1.28 gpf or less and include dual-flush technology. Rebates are often available.

Activity 1.4: Ensure all sink faucets are equipped with an aerator that uses 2.5 gallons per minute (gpm) or less. When purchasing new fixtures, use 0.5-1.5 gpm faucet aerators for the most water, energy and cost savings. Free or low cost devices may be available through the local water company.

Activity 1.5: Consider water reuse from sink to toilet for new bathroom fixtures (<http://www.watersavertech.com/AQUS-Diagram.html>).

Activity 1.6: Ensure that all showerheads use 2.5 gpm or less. When purchasing new fixtures, use showerheads that use 1.5 gpm or less for the most water, energy and cost savings. Free or low cost devices may be available through the local water company.

Activity 1.7: Post signs in restrooms and kitchen to encourage water conservation and to report leaks.

Activity 1.8: Reduce water pressure to no higher than 50 psi by installing pressure-reducing valves.

Activity 1.9: Evaluate the building's drinking water quality and get it to a drinkable point without further treatment. Reduce the amount of bulk-bottled water supplied in the building.

Strategy WRM-2: Improve storm water runoff.

Activity 1.1: Look into the feasibility of installing a rainwater harvesting system. Steps include cleaning the roof, disconnecting the downspout from the sewer, and connecting it to a

storage container (http://sfwater.org/mto_main.cfm/MC_ID/14/MSC_ID/361/MTO_ID/559). Use this water for landscape plants on the campus instead of using sprinklers.

Activity 1.2: Use porous cement if repaving the parking lot is necessary in the future,

Activity 1.3: Regularly check and maintain storm drain openings and basins. Keep litter, debris and soil away from storm drains.

Activity 1.4: Keep dumpsters covered and impermeable to rainwater. Keep them from overflowing, and keep dumpster/parking areas clean.

Activity 1.5: Use a broom, not a hose, to clean paved areas.

Strategy WRM-3: Improve landscaping and irrigation.

Activity 1.1: Tie into Crissy field grey water system when available

Activity 1.2: Invest in storm water retention systems

Activity 1.3: Plant (or renovate using) drought tolerant plants and ground cover, preferably native species.

Activity 1.4: Work with Park Service to adjust sprinklers for proper coverage—optimize spacing, and avoid runoff onto paved surfaces.

Activity 1.5: Work with Park Service to adjust sprinkler times and/or duration according to seasons. Water during non-daylight hours (generally before 7 AM or after 9 PM). Consider weather based irrigation controllers that automatically adjust sprinkler times based on historic or real-time weather data. Rebates often available from the local water company.

Activity 1.6: Ensure that hoses are equipped with a low flow spray nozzle that has an automatic shut-off to prevent water waste when the hose is not in use. Free or low cost devices may be available through the local water company.

EVALUATION

1. Monitor and conduct ongoing water audits once a year through monthly statements.
2. Based on water audit results and as needed, develop additional strategies to increase water efficiency.
3. Report accomplishments and any needed actions annually to Sanctuary Advisory Council.

POTENTIAL PARTNERS

Golden Gate National Recreation Area, Presidio Trust (Water Treatment Plant), San Francisco Public Utilities Commission, San Francisco Department of the Environment, San Francisco Department of Public Works

V. EDUCATION & OUTREACH

GOAL: Encourage the public and staff to reduce green house gas emissions through education and outreach.

Objective: Initiate environmental education and outreach specific to green activities on campus.

Strategy EO-1: Display signage reflecting green practices.

Activity 1.1: Implement a campus-wide signage program to educate staff and visitors and help them make proper decisions, e.g. compost/recycle/trash bin labels, turn off light switches, labeling environmental technologies/products (low flush toilets/recycled paper products).

Activity 1.2: Use signage during building construction/renovation projects to educate visitors passing by about green building practices.

Activity 1.3: Post green rules of conduct in public places. Post “Green Meeting Rules” in meeting rooms. Post energy audit results in staff supply room and meeting areas.

Strategy EO-2: Conduct site tours and classes specific to green practices.

Activity 1.1: Provide tours of facility to highlight green operations. Educate visitors on the benefits to the ocean and subsequently to humans of conserving energy and water, as well as waste reduction. Include information on green operations in an audio tour of the campus.

Activity 1.2: Educate the janitorial staff on waste reduction activities.

Activity 1.3: Conduct periodic recycling, composting, and universal waste trainings.

Activity 1.4: Conduct energy and waste audits; educate staff on the results, including per-capita estimates.

Activity 1.5: Train staff on energy efficient equipment and systems.

Activity 1.6: At discretion of the Site Superintendent, include “participate in site’s greening activities” in employee performance plans and job descriptions.

EVALUATION

1. Draft an annual Green Operations Report that includes the results from annual audits. Present the report to the Advisory Council annually and post it to the Gulf of the Farallones National Marine Sanctuary website.

POTENTIAL PARTNERS

Golden Gate National Recreation Area, Presidio Trust, San Francisco Department of the Environment

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Citations:

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2008 Greenhouse Gas Emission Inventory for the Gulf of Farallones National Marine Sanctuary

Gulf of the Farallones National Marine Sanctuary (GFNMS) partnered with the National Park Service's (NPS) Golden Gate National Recreation Area (GGNRA) to complete a baseline inventory of 2008 greenhouse gas emissions resulting from facility use, operations, and transportation activities centered around the sanctuary's headquarters. The NPS Climate Friendly Parks Program provides a free tool for parks to inventory their greenhouse gas emissions. The [Climate Leadership In Parks \(CLIP\) Tool](#), available on the National Park Service website, has the ability to assess different units of the park, such as park operations, transportation, and waste.

Although designed for parks, GFNMS was able to use the CLIP Tool because its facilities and operations are very similar to that of a park. The CLIP Tool functions should be compatible with all sanctuary offices within the National Marine Sanctuary System.

Data were gathered from utility statements, internal records, and an employee transportation survey. The baseline Greenhouse Gas (GHG) inventory included totals for stationary combustion fuel (natural gas for heating), purchased electricity, mobile combustion mileage and fuel use (auto, public, and air transportation), wastewater treatment, and municipal solid waste and disposal.

For the purpose of this audit, emissions were measured only for internal staff at the headquarters facility on Crissy Field, and not for visitors to the sanctuary. Each input is described in greater detail below, with a per capita emission estimate provided at the end of this document.

General Information:

Unit Evaluated: Gulf of Farallones National Marine Sanctuary Crissy Field Headquarters, San Francisco, CA

Year Inventoried: 2008

Information provided by: Brian Johnson, Deputy Superintendent

Inventoried Operations: Stationary Combustion, Purchased Electricity, Mobile Combustion, Wastewater Treatment, Municipal Solid Waste and Disposal

Length of Season: 12 months

Length of Average Stay: 200 days (workdays)

Number of buildings: 1

Number of Full-Time Staff Equivalents: 23 (12-GFNMS, 7-FMSA, 4-IFR)

Stationary Combustion:

The stationary combustion (natural gas used for heat and hot water) numbers were derived from Pacific Gas & Electric statements. PG&E is our local utility provider.

Natural Gas: 3603 Therms of natural gas used in 2008

Conversion: 1Therm = 100 cubic feet.
Input: 360,300 cubic feet.

Purchased Electricity:

The stationary combustion numbers were derived from PG&E statements

Electricity: GFNMS paid \$7230 in 2008
The Presidio Trust utility rate is \$0.141 per kWh.
Input: 51,277 kWh.

Mobile Combustion/Ground & Sea Transportation:

A survey was conducted of all staff to determine the method in which they commuted to work. They could choose from car, carpool, bus, train, bicycle, or walk. All travel to and from the Crissy Field Headquarters office was counted, including use of two government vehicles. This estimate also accounts for the use of the R/V FULMAR, the sanctuary's research vessel, for 37 days each year.

Total staff: 23
Primary transportation: 15 auto, 4 auto/bus/bike, 3 bike, 1 bus
Government vehicles on-site: 2 (1-Van, 1-Hybrid; assumed average 22mpg per auto)
Input: Autos, fueled with gasoline – 169,690 miles
Input: Buses, fueled by diesel – 16,900 miles
Input: Boats – 4000 gallons of diesel

Mobile Combustion/Air Transportation

The transportation survey also asked all staff to estimate the total miles they flew on work related travel in the past year.

Total airplane miles: 98,400 miles.
Conversions: Greenhouse Gas Protocol Initiative calculation for long haul, economy class air travel = 0.1416 kg CO₂ per passenger mile; 1kg = 0.001 metric tons.
Input: 13.93 metric tons of CO₂ equivalent.

Wastewater Treatment:

Sewer charges are derived from water consumption. Because GFNMS is located in a Mediterranean climate, rain is seasonal and predictable. It typically rains from October to March, and is dry from April to September. For this estimate we assumed no irrigation was required in wet months. These numbers were derived from Presidio Trust sewer charges to the sanctuary (via GGNRA) during wet and dry months. This estimate focused on both potable water consumed by the buildings tenants, and that used for irrigation.

Based on the 2008 NPS Utility Billing Summary, GFNMS paid \$2976.83 for sewer in 2008. The Presidio Trust utility rate is \$9.37 per kgal. Conversion: 1 kgal = 1000 gal.
Total: 317,698 gallons.

Building-only: GFNMS paid \$636.67 in 2008 based on the sewage bills for wet months. The Presidio Trust utility rate is \$9.37 per kgal.

Conversion: 1 kgal = 1000 gal.

Building-only Total: 67,948 gallons for 6 months, or 135,896 for 12 months.

Input: Building only - 135,896 gallons (43%)

Irrigation-only: 181,802 gallons (57%)

Solid Waste:

These numbers were derived from the on-site refuse collection bin.

GFNMS has one 2-cubic yard container for waste, picked up once a week. At pick up, the container is usually at 50% capacity.

Conversions: 1 cubic yard = 500 pounds; 1 pound = 0.0005 short tons.

Input: 13 short tons.

EMISSION RESULTS

After plugging in the above estimates, the NPS CLIP Tool derives the total Metric Tons Carbon Dioxide Equivalent (MTCO₂E) based on each input. For long-term tracking purposes, this number was converted into a per capita total.

The final numbers were used to generate graphs and charts below. More detailed results are available in the CLIP Tool, such as emissions of each greenhouse gas CO₂, CH₄, N₂O, and HFC. 2008 results will be used as the baseline for all future analyses.

Gross Emissions by Sector (MTCO₂E)

	Stationary Combustion	Purchased Electricity	Mobile Combustion	Wastewater Treatment	Solid Waste	Gross Emissions
Sanctuary Operations	20	18	164	1	0	203

Per Capita Emissions

203 metric tons / 23 staff = 8.826 MTCO₂E per staff person equivalent in 2008

Summary Results

The following tables provide summary results.

