4.9 Technologies and Standards Appropriate to the Flamingo Area

Site Technologies and Standards

FEDERAL MANDATES AND GUIDELINES FOR WATER, ENERGY & CARBON REDUCTION

Energy

Energy Policy Act of 2005

- The Energy Policy Act of 2005 set energy reduction goals for existing federal facilities by 20 percent, which was to be accomplished by the Fiscal Year 2015. This policy was superseded by Energy Independence and Security Act (EISA) of 2007.

Executive Order 13423

- Executive Order 13423 requires the reduction of energy use by 3 percent per year between Fiscal Years 2008 and 2015), and a 30 percent total reduction by 2015 from 2003 energy use levels.
- Secure 50 percent of renewable energy from new sources. This is required for buildings built in 1999 or later.

Energy Independence and Security Act of 2007

The purpose of the EISA is "to move the United State toward greater energy independence and security, to increase the production of clean renewable fuels, to protect consumers, to increase the efficiency of products, buildings, and vehicles, to promote research on and deploy greenhouse gas capture and storage options, and to improve the energy performance of the Federal Government, and for other purposes."[2]

- Section 431: Reduction of energy use (relative to the 2005 level) by 3% per year between Fiscal Years 2008 and 2015, with a total reduction of 30% from 2003 energy use levels by 2015.
- Section 432: Directs that federal energy managers perform comprehensive water and energy evaluations at each facility at least every four years, and implement measures within two years.
- Section 433: New and renovated federal buildings must reduce fossil fuel use by 55% (from 2003 levels) in 2010, by 80% by 2020, and be carbon-neutral by the year 2030.
- Section 434: Utilize the most efficient energy design, systems, and equipment for major replacements, such as heating and cooling systems
- Section 523: New and renovated buildings must meet 30% of hot water demand through solar hot water systems by the year 2015.

2 Pelosi, Nancy (2007-01-12). "House Speaker's Description of Legislation." Speaker of the House. United States House of Representatives.

Water

Energy Policy Acts of 1992 & 2005

These acts set national efficiency standards and specifications for residential and commercial water utilizing fixtures and appliances. The implementation of low-flow fixtures and appliances will assist with reducing the Flamingo energy demand and carbon footprint by reducing the overall water demand.

Executive Order 13514 (2009)

This order requires that all existing federal facilities reduce their potable water consumption intensity, from a baseline of Fiscal Year 2007, by 2 percent per year by 2020, for an overall reduction of 26 percent. This order also requires a reduction in industrial, agricultural and irrigation water consumption of 2% per year between 2010 and 2020, for a 20% total reduction. To ensure these reductions are achieved, prior to the design phase of redevelopment, a detailed analysis of the historical water consumption and intensity at Flamingo will need to be conducted in order to determine the necessary actions.

Carbon

Executive Order 13514

- Specific goals for the reduction of greenhouse gases must be established for 2020 using baseline data from 2008.
- Federal agencies must increase the use of renewable energy sources and implement renewable energy generation on site.
- Achieve a reduction in fossil fuel use by:
  - Utilizing low carbon emitting vehicles
  - Optimizing the use and number of fleet vehicles
  - Reducing the use of petroleum products (from a 2005 baseline) by 2 percent annually through 2020.

OTHER FEDERAL MANDATES AND GUIDELINES

Executive Order 11988

This executive order is intended to protect wetlands. The existing and proposed developments within Flamingo are contained within areas that were historically filled; no additional use of fill or other adverse impacts to wetlands are proposed. The restoration and creation of wetlands and other native habitats will be included as part of the redevelopment plan.

Executive Order 11990

This executive order oversees floodplain management, with the intent of reducing or eliminating development within floodplain areas. However, the development at Flamingo is unique and since the entire area is within the floodplain, meeting this requirement is not possible. To reduce the impact on the floodplain and the surrounding natural environment, no additional filling of the floodplain or impacts to native areas are proposed.

Clean Water Act

The objective of this national standard is "to restore and maintain the chemical, physical, and biological integrity of the nation's waters." The act supports the establishment and enforcement of water quality standards. (Draft Commercial Services Plan 2007) Water-sensitive urban design, the implementation of low impact development strategies that utilize best management practices, maintaining pre-development runoff rates and limiting the pollutant discharge will contribute significantly to maintain water quality.

LEED

The construction of new buildings within federal facilities are required to meet the United States Green Building Council's (USGBC) Leadership In Energy and Environmental Design (LEED) Silver rating for New Construction.

FLORIDA REGULATIONS AND OTHER OVERARCHING STANDARDS

Outstanding Florida Waters

In accordance with the Clean Water Act, Florida has designated all waters of the Everglades National Park as Outstanding Florida Waters (OFW). This was conveyed via Section 403.061(27) of the Florida Statutes, which grants the Florida Department of Environmental Protection (FDEP) the power to establish these waters as OFWs and as worthy of protection.

National Park Service –Director's Orders (DO) (Sustainability Related)

- DO #12: Conservation Planning per National Environmental Protection Act and National Park Service Organic Act
- DO #77-1: Natural Resource Protection – implementation of Executive Order 11990
- DO #77-2: Natural Resource Protection – implementation of Executive Order 11988

Site Sustainability Strategies

Some overlap with building systems may exist since the site and building systems are integrated and each affects the other.

ENERGY REDUCTION

The use of renewable energy can greatly reduce the overall carbon footprint of Flamingo, in addition to lowering operation and maintenance costs, and in some cases, capital costs. There can also be an improved lifecycle cost and an increase in savings through extending the life of costly mechanical systems.

Some strategies to reduce energy and meet the federal mandates include:

- Use of solar arrays
- Use of wind generation turbines
- Use of site lighting fixture-mounted solar photovoltaic panels and/or micro wind turbines
- Use of high efficiency water and wastewater treatment systems
- Use of solar water heating
- Appropriate use of interior and exterior site lighting to prevent overlighting and light spillage
- Use of light sensors or timers
- Use of water treatment system work exchangers to lower pumping demand
- Continued training of key personnel to operate and maintain systems utilizing new technologies
- Implementation of green procurement policy
- Continued auditing of system to verify efficiencies and reduce waste

WATER REDUCTION

The use of water conservation techniques and devices not only conserves water, but also the energy used to treat and pump the water, which can contribute to a reduction in the overall carbon footprint of Flamingo. In addition, the conservation of water can lower capital costs, operation and maintenance costs, and improve the lifecycle cost and savings by extending the life of costly mechanical systems.

Some strategies to reduce water consumption and meet the federal mandates include:

- Use of low flow water fixtures (as described in the sustainable building section below)
- Use of native, low water plant materials (Xeriscaping)
- No permanent irrigation
- Harvesting and reuse of rooftop rainwater for toilet flushing
- Harvesting and reuse of air conditioning condensate for toilet flushing
- Harvesting and reuse of greywater for toilet flushing or irrigation
- Maintaining adequate water distribution system chlorination and pressure (reduces system flushing)
- Sub-metering for all facilities to track water use and detect leaks
- Use of efficient HVAC systems that require little or no water use
- Continued training of key personnel to operate and maintain systems utilizing new technologies
- Implementation of green procurement policy
- Continued auditing of system to verify efficiencies and reduce waste

WATER QUALITY

Water Sensitive Urban Design / Low Impact Development: The use of Water Sensitive Urban Design (WSUD) strategies, Low Impact Development (LID) devices, and Stormwater Best Management Practices (BMPs) can reduce the Total Maximum Daily Pollutant Loading (TDMLs) and increase the quality of stormwater flowing into adjacent surface waters and infiltrating into the groundwater.

Relevant stormwater BMPs and LID devices are:

- Porous Pavement: the use of porous pavement can assist with reducing the stormwater runoff and the transportation of pollutants into the marina basins and Florida Bay. The applicability and feasibility of this device will require a detailed analysis of the soils and specific performance requirements, whether to reduce pollutants or to meet LEED.
- Bio-Retention Ponds: the use of created wetlands and small ponds close to pollutant sources to capture and treat stormwater runoff from small storm events and first flush of larger events.
- Infiltration trenches and pits: these devices direct stormwater runoff from specific sources into sub-surface infiltration chambers which provide a level of pre-treatment and can reduce the runoff volume.
- Other BMP devices that may be applied to the site as part of the WSUD/LID development:
  - Detention Basin
  - Filter Strips/ Bioswales
  - Dry Swales
  - Sedimentation Basin
  - Oil & Grit Separator
  - Green Roof
  - Dry Well
- Land Application of Treated Sewage Effluent (TSE): since the sanitary waste is treated to a very high level, the disposal of this effluent water can be done through various means, including site-wide land application or irrigation. Although the need for irrigation may be minimal or even non-existent, the use of the TSE for irrigation is an accepted and sustainable way to dispose of this water. This may become more relevant and important as the redevelopment of Flamingo is completed and the volume of sanitary wastewater increases, especially if this volume exceeds the capacity of the current effluent evaporation and percolation ponds.

CARBON REDUCTION

Relevant strategies to reduce carbon footprint are:

- Reducing vehicle miles traveled (VMTs) by fleet vehicles
- Reducing or eliminating use of fossil fuels in fleet vehicles
- Use of alternative means of transportation for visitors, including walking and bicycling
- Use of mass transit for employees to reduce VMTs
- Reducing potable water demand
- Reducing energy demand
- Increased use of renewable energy sources
- Increased use of water reuse
- Increased use of plant materials with high carbon sequestration rates

Architectural Technologies and Standards

BUILDING CODES AND REQUIRED CONSTRUCTION STANDARDS

- Design to the Florida Building Code 2007 Edition, adopted March 2009, Hurricane Zone VE, 150 mph wind loads (or currently enforced Florida Building Code).
- Design to flood insurance floor elevations of minimum 15 feet above Mean Sea Level (or currently enforced mandates).
- Track current climatic change projections for Mean Sea Level rise over 50 years and increased storm intensity levels (in 2008 the median projection was for a 14 to 16 inch rise in sea level in South Florida). Revise design requirements to accommodate projected climatic conditions.
- Apply the Secretary of the Interior's Standards for the Treatment of Historic Structures for planned work in and around historic structures.
- Incorporate the requirements of the National Park Service Sustainability Checklist in all design and documentation.
- Employ applicable accessibility guidelines, including American's with Disabilities Act, Section 504, UFAS and ADAAG.

RECOMMENDED CONSTRUCTION STANDARDS

Raised Building Elevations

- Raise building floor elevations to protect people, systems and water sensitive construction from storm impacts
- Elevate all building systems and typically occupied floor elevations above flood level or protect with dry flood-proofing enclosures below flood level (minimum 15 feet above sea level).
- Elevate utilitarian structures, support facilities, maintenance buildings and other miscellaneous structures on filled pads above storm surge level (estimated 10 feet above sea level)
- Incorporate non-water sensitive materials for areas below flood level

Structural Systems

- Utilize structural slab-on-raised-structural-fill or slab-on-piling foundations for maintenance structures located at or above general Flamingo fill elevation
- Utilize surge protection buffers at slab type foundations and at on-grade facilities
- At foundation systems without structural pilings, provide structural fill to oolite strata and extend fill 5 feet horizontally around perimeter of slab
- Where structural slab foundation systems are not practical, utilize precast concrete foundation pilings to elevate building structures above flood elevations to meet state of Florida and Monroe County building codes.
- Extend pilings approximately 5 feet into limestone strata. Total piling length to be determined by geotechnical analysis at project site
- Evaluate reclaimed fill material (from proposed restoration areas) for reuse as structural or backfill
- At slab foundations, utilize concrete masonry unit wall structure with aluminum pre-manufactured truss framed roof systems
- At raised slab buildings, utilize structural modular concrete and pre-cast building systems to minimize on-site construction requirements
- Utilize aluminum components for exposed structural framing to avoid corrosion
- Utilize structural steel only when fully encased and protected from corrosion
- Avoid wood framing
- Avoid exposed steel framing

Materials and Finishes

- Complement historic finishes and materials consistent with the Secretary of the Interior's Standards for the Treatment of Historic Structures
- Standard exterior materials include sealed or painted concrete and masonry finishes or 3-coat stucco system over concrete or masonry construction
- Exterior accent materials include aluminum or cementitious panels and locally relevant materials (i.e. cochina stone)
- Utilize mill finish aluminum at exterior exposed metal (structural or decorative)
- Utilize aluminum framed windows with high performance glazing
- Utilize aluminum screening for windows and exterior enclosures
- Incorporate manual hurricane shutters at all window and screened openings
- Incorporate motorized hurricane shutters where manual operation is impractical
- Utilize perforated recycled boardwalk decking for occupied exterior spaces and walkways
- Utilize light colored prefinished aluminum metal roofing at sloped roofs, incorporate applied photovoltaic systems where practical
- Utilize light colored membrane roofing at flat roofs. Incorporate embedded photovoltaic systems where practical

Conveyance Systems

- Provide accessible entry and egress at all buildings and structures
- Where possible, utilize ramping and transitional graded areas to achieve vertical circulation (in lieu of lifts or elevators) to minimize maintenance
- Where necessary, utilize and protect lifts and/or elevators
- Utilize traction type elevators to ensure that equipment is above flood level.
- Fully enclose and protect elevator doors and shafts
- Utilize ramps or grade transitions to ensure elevator entry is elevated a minimum of 5 feet above Mean Sea Level
- Utilize wheel chair lifts at interior applications only

Mechanical Systems

- Locate all equipment above flood level (condensers, air handlers, motors, pumps, etc.)
- Specify premium efficiency mechanical systems at each individual building
- Incorporate geo-thermal and geo-exchange sources for cooling and heating where possible. Consider site impact of loop wells on historic context
- Where possible, eliminate all exterior equipment. Protect necessary exterior equipment from water surges and from damage by windborne debris
- Where possible, protect and damper all exterior wall penetrations

Plumbing Systems

- Reduce demand, reclaim and reuse potable water wherever possible
- Utilize ultra low flow fixtures and faucets
- Utilize waterless urinals
- Provide rainwater and greywater collection and reuse systems at all new buildings that have an applicable water load
- Size collection systems should be sized to meet the applicable load of the building
- Locate all pumps and equipment above flood level
- Utilize solar water heat at all Flamingo buildings

Electrical Systems

- Incorporate photovoltaic power generation throughout Flamingo
  - Engineer photovoltaic systems to return generated power to the overall grid
  - Locate all electrical equipment above flood level
  - Utilize high efficiency lighting and controls to reduce energy demand

Architectural Sustainability Strategies

The Master Plan exemplifies the sustainable vision of the National Park Service and is intended to guide planning, design, construction, restoration, and use of Flamingo for the next 50 years. All buildings designed within the district must employ a unique set of sustainable principles suited to Flamingo's specific environment. Flamingo's climate is seasonally harsh, which dictates a sustainable building approach reliant on practical, fundamental and integrated design approaches and durable, low maintenance technologies.

Flamingo's historic developments provide living examples of fundamental design approaches appropriate to this climate. Existing buildings illustrate passive orientation for wind and sun as well as use of local and durable materials. Designs for Flamingo's redevelopment must balance contemporary innovations and technologies with the demonstrated successes of these sound design principals.

The influences of Flamingo's harsh climate, historic context, remote location, and National Park status determine the strategies and technologies on which to focus future designs.

GENERAL REQUIREMENTS

- Utilize the National Park Service Sustainability Checklist to identify and test appropriateness of sustainable opportunities for each project proposed in Flamingo.
- Utilize the US Green Building Council standards for guiding sustainability. Design projects to achieve LEED Silver Certification.
- Establish maintenance and management protocols to ensure implementation of high performance building characteristics.
- Showcase sustainable features as an integral part of the visitor experience.

FUNDAMENTAL CONSIDERATIONS

- Limit proposed development boundaries to currently or previously developed areas.
- Consolidate uses to reduce Flamingo's overall development footprint.
- Implement practical passive systems for the region.
- Implement residential-scale strategies and systems to minimize costs, simplify maintenance, accommodate phased development, and facilitate meaningful interpretation.
- Implement environmentally conscientious maintenance and operation of facilities.
- Ensure that employees are well-trained to operate and maintain the new systems.

SPECIFIC CONSIDERATION: CONSERVE AND CREATE POTABLE WATER

Flamingo's remote location requires on-site water treatment. Producing potable water is energy intensive and results in significant operating and maintenance costs. Conserving water and providing alternate sources for non-potable uses offsets system requirements, saves water, and reduces operating costs.

- Utilize ultra low flow and waterless plumbing fixtures.
- Consider auto on/off and auto flush fixtures to control overuse.
- Utilize hot water sensing showerheads to avoid initial water waste during heat up.
- Offset potable water demands and water treatment quantities by collecting greywater to flush toilets.
- Offset potable water demands by collecting rain water to flush toilets or water plants when required.
- Collect condensate from air conditioning systems to supplement building water requirements in the summer.
- Selectively implement condensate, rainwater, and greywater collection respectively, and only until building needs are met. Install tanks and enclosures sized to handle building requirements.

Technology and Standards, Character Qualities

- Horizontal planes punctuated by vertical masses
- Elevated building and exposed structure
- Pre-fabricated modular building components
- Exposed exterior vertical circulation
- Low sloped roofs
- Punched openings
- Deep overhangs and shading protection with shutters for sun control and hurricane protection
- Precast concrete, aluminum, coral rock and regional/local materials

Flamingo Lodge

SPECIFIC CONSIDERATION: CONSERVE AND CREATE ELECTRICITY

The redevelopment and continued operation of Flamingo as a lively visitor destination will maintain and likely increase energy demands. While Flamingo is served by Florida Power & Light utility, Flamingo is the beneficiary of abundant solar resources for the production of local, renewable and clean energy.

Based on current conditions, electricity that is generated at Flamingo is most beneficial if it is returned to the electrical grid, providing a clean, supplemental source to utility company production.

- Proposed development is to occur in phases, yet photo-voltaic arrays can be sized based on the building area (roof or wall) or site area available to them. By feeding the grid rather than batteries, excess power production can benefit the overall park rather than feed and discharge from a localized battery. This takes advantage of an existing shared system without creating an independent power plant.
- Flamingo's use is seasonal and Flamingo's summers are intensely hot, resulting in inconsistent electrical demands. Sizing systems to meet demands becomes problematic, making shared resources more appealing.
- Flamingo's coastal eco-system can foster a corrosive environment for battery based storage and transfer systems. Maintenance and replacement costs for these systems may exceed their overall value in this climate.
- Typical arrangements with utility companies benefit consumers who provide clean power to the grid (currently the rate paid for clean power units is double the rate charged for power units). The net gain to Flamingo is substantial without the maintenance of expensive equipment.

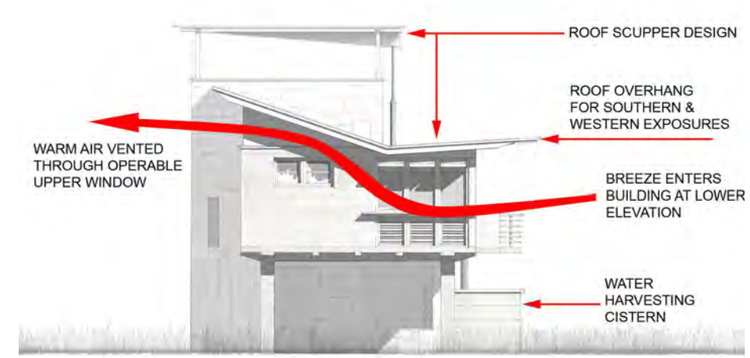
Power requirements at Flamingo are substantial, including powering potable water and wastewater treatment plants, site lighting, building power (lighting, air conditioning, refrigeration, user power), campsites, and housing locations. These power requirements will likely increase with the proposed redevelopment of Flamingo, but can be substantially offset by practical, sustainable strategies. There are great opportunities to reduce Flamingo's operating expenses and dependence on remote utilities by reducing electrical demand and generating power on site.

- Utilize passive design strategies to reduce building cooling loads:
  - Orient linear buildings with long axis east to west to reduce exposure to hot afternoon sun and to capture northern daylight and coastal breezes.
  - Locate operable openings on opposing north and south faces to ensure cross ventilation from coastal breezes.
  - Utilize overhangs and shading devices to protect southern facing openings from Flamingo's intense direct sun and associated solar heat gain.
  - Incorporate constructed or natural shading devices to protect east, west and south building faces from direct sunlight.
  - Maximize north facing openings for daylighting interior spaces.
- Enhance building envelope performance to reduce building cooling loads:
  - Maximize insulation about the entire building envelope and seal all penetrations to contain conditioned air inside building.
  - Use highly reflective wall and roofing materials to reflect intense direct sunlight.
  - Incorporate high performance glazing and engineered overhangs to limit solar heat gain inside buildings.
  - Locate equipment in conditioned spaces for optimized performance.
  - Incorporate vestibules or air locks to minimize heat transfer and to control insects.
- Employ energy efficient systems
  - Consider ground source, geo-exchange systems with water source heat pumps to reduce electrical demands associated with extreme air temperatures in the summer.
  - Appropriately size mechanical equipment for high performing building envelopes.
  - Consider energy recovery systems at air-conditioned spaces to capture and reuse energy from already conditioned air. This energy recovery reduces electrical demands associated with extreme air temperatures in the summer.
  - Incorporate zoned spaces, advanced controls, and variable speed motors for customized mechanical system efficiencies.
  - Utilize EnergyStar and/or FEMP rated appliances and equipment.
  - Design lighting to complement planned daylighting.
  - Consider high efficiency lighting technologies such as high output fluorescent and LED combined with dimming controls.
  - Incorporate daylight harvesting systems.
  - Incorporate advanced lighting controls and dimming for multi-use spaces.
  - Utilize solar water heating.

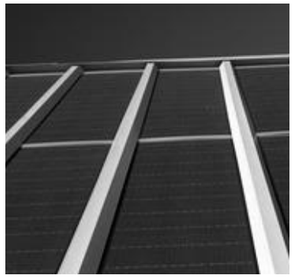
"Sustainable design balances human needs (rather than human wants) with the carrying capacity of the natural and cultural environments. It minimizes environmental impacts, it minimizes importation of goods and energy as well as the generation of waste. The ideal situation would be that if development was necessary, it would be constructed from natural sustainable materials collected on-site, generate its own energy from renewable sources such as solar or wind, and manage its own waste."

U.S. National Park Service:
Guiding Principles of Sustainability

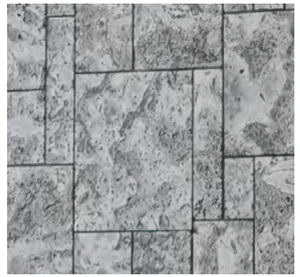
Climate Responsive Design



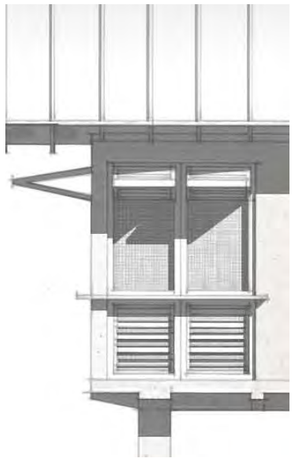
Passive Design Diagram



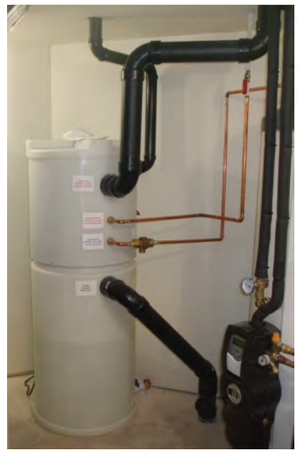
Integrated Solar Collectors



Local Materials: Coral Rock



Overhangs and Shading Devices ideal for Southern Exposures



Greywater Collection and Treatment System

"The Federal Government is committed to designing, locating, constructing, maintaining, and operating its facilities in an energy efficient and sustainable manner that strives to achieve a balance that will realize high standards of living, wider sharing of life's amenities, maximum attainable reuse and recycling of depletable resources, in an economically viable manner, consistent with Department and agency missions."
Federal Leadership in High Performance and Sustainable Buildings' *Memorandum of Understanding*

- Consider building management programs to ensure continued building performance.
- Research and employ current advanced technologies. Consider technologies which create symbiotic combinations (i.e. capture geo-exchange heat output to heat water), consider remote control building management systems for consistent performance; carefully select equipment based on seasonal use criterion.

- Generate solar power.
  - Generate clean electricity from the abundant renewable solar resource in Flamingo to supplement utility company provided power.
  - Incorporate photovoltaic systems at all new building roofs. Wherever possible, utilize systems that are integral to roofing materials and are resistant to corrosion.
  - Orient building roofs for optimum solar power generation. Primary roof surface should face generally southward (30 degree tolerance) and should follow a slope between 25-40 degrees.
  - Design roofs to structurally support selected photovoltaic array systems.
  - Incorporate photovoltaic technologies that are integral to building materials.
  - Carefully consider local climate concerns (saltwater, hurricane force winds/debris, extended periods of rain) at each proposed application to confirm appropriate selection.
  - Ensure that adequate building area is provided to accommodate required inverters and metering equipment.
  - Employ solar water heat for all buildings requiring hot water.
  - Research and employ current advanced technologies. Consider technologies such as compact solar power generator/storage modules for use at eco-tents to limit utility infrastructure, photovoltaic films within wall or roof materials for protection from hurricane winds and debris, solar collector panels within road beds to improve sustainability of current asphalt surfacing.

SPECIFIC CONSIDERATION: RESPONSIBLY UTILIZE MATERIALS

- Reduce, Reuse, Recycle wherever possible.
- Implement a recycling program for visitor use.
- Retain and reuse existing buildings.
- Reduce new building footprints by consolidating uses and accommodating shared uses.
- Incorporate shaded, breezy exterior spaces in lieu of enclosed interior spaces.
- Recycle existing fill from restoration areas, where appropriate, for use in new fill areas.
- Require construction waste management practices. Reduce construction waste and recycle all reusable debris.
- Prioritize products based on durability and ease of maintenance.
  - Preferentially procure materials that are manufactured or harvested locally.
  - Preferentially procure materials with significant recycled content.
  - Preferentially procure materials with rapidly renewable material content.
  - Preferentially procure materials that have low emissions of volatile organic compounds.
  - Preferentially procure materials that bear labels of industry approval for sustainable production or content (i.e., Green Guard furniture, Green Seal cleaning products or Green Label Plus Carpets).