Salt River Bay
Marine Research and Education Center

Planning a World Class, Sustainable Marine Laboratory in the United States Virgin Islands

Project Overview
May 2011

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Salt River Bay Marine Research and Education Center (MREC) will be:

- A world-class, sustainable facility serving many partners through programs in:
  - Collaborative marine research
  - Caribbean studies, history, archeology and related fields
The MREC also will create opportunities to:

- Demonstrate emerging technologies in green building design, and sustainable energy systems in the tropics

- Showcase the unique concept of “research in a park” including:
  - “Ridge-to-Reef” environmental education programs
  - Local educational programs (K-12/adult)
  - Museum collections facility and archeological field school
The Office of Insular Affairs, NPS and four university partners are working together to create a **state-of-the-art, sustainable marine lab** on St. Croix.

Much of work focuses on efforts in **research and education**, but one very important element is ensuring the **MREC engages the local Virgin Islands community** and provides for education and research opportunities for Virgin Islanders, especially the people of St. Croix, within its broader mission.
Joint Institute for Caribbean Marine Studies

Consortium of four universities:

- University of the Virgin Islands
- University of North Carolina Wilmington
- Rutgers, the State University of New Jersey
- University of South Carolina
Mission of the JICMS

To establish a multidisciplinary partnership of academic, government and private institutions

- to better understand the sustainability and health of tropical and subtropical marine ecosystems in the waters of the Virgin Islands and other Caribbean regions;

- through scientific studies, student education and public awareness of the economic and cultural heritage associated with coral reef systems
Federal and Territorial Partners

MREC brings together long-term support of:

- Department of the Interior
  - Office of Insular Affairs
  - National Park Service
- Government of the Virgin Islands
Goal: Get the MREC concept and JICMS in position for design/partnership/fundraising to move forward
Salt River Bay
Marine Research and Education Center

Salt River Bay NHP & EP

Proposed Marine Research & Education Center

Buck Island Reef NM

Christiansted NHS - HQ

Proposed Castle Nugent Farms NHS
11,500 acres from Ridge to Reef

East End Marine Park (Territorial)

St. Croix Heritage Area (HR 1594), 2003

★ SRS Alexander Hamilton Boyhood Home & Associated Sites, 2009
SARI was created to “preserve, protect and interpret … nationally significant historical, cultural and natural sites and resources … with particular emphasis on the preservation of both the cultural and natural resources and long-term scientific study of terrestrial, marine and archeological resources”

(Public Law 102-247)
Why NPS Needs the MREC

- To add capacity for science-based resource management within St. Croix NP units
- To support marine inventory and monitoring and resource conservation efforts
- To train the next generation of resource managers and scientists
- To address increasing management challenges and needs of expanding St. Croix NP units
### Significant Marine Resources

<table>
<thead>
<tr>
<th>NPS/GVI PARK UNIT</th>
<th>SUBMERGED ACRES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buck Island Reef NM (BUIS)</td>
<td>19,015</td>
</tr>
<tr>
<td>Salt River Bay NHP &amp; EP (SARI)</td>
<td>612 (co-managed with GVI)</td>
</tr>
<tr>
<td>Castle Nugent NHS (CANU)</td>
<td>8,600 (plus 4 to 5 miles of shoreline)</td>
</tr>
<tr>
<td>Virgin Islands National Park (VIIS)</td>
<td>5,650</td>
</tr>
<tr>
<td>Virgin Islands Coral Reef NM (VICR)</td>
<td>12,708</td>
</tr>
<tr>
<td>East End Marine Park (STX EEMP)</td>
<td>38,400 (incl. 5 sq. mi. of “no take”)</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>84,985</strong></td>
</tr>
</tbody>
</table>
Project Benefits:
Park, Partners & Community

Addressing Ocean Resource Issues

- Expands NPS capacity to address Climate Change impact on marine resources through research and monitoring – biology, geology, oceanography, mapping

- Provides major site to begin marine resource recovery in the Caribbean region
Project Benefits:

Park, Partners & Community

Supporting Education and Public Awareness

- Provides for student education and training with concentrations on science and math

- Connects people to the park, provides venue into marine sciences and research
History of Partnership in Marine Research

1960s  Fairleigh Dickinson University’s West Indies Laboratory

1970s  NOAA’s NURP Underwater Habitats at Salt River Bay

1989  Hurricane Hugo

1999  MOU establishes the MREC Concept

Unique, long-term studies led to expansion of BUIS and establishment of SARI and East End Marine Park; MREC will build upon historic data to deal with current resource threats.
Recent Planning Efforts

2001  NPS acquires 73 acres at Salt River Bay
2004  Feasibility Study conducted
2006  Environmental Assessment launched
2009  FONSI signed for East Site location

MREC East Site: Preliminary Concept Plan (2005)
Significant Progress Has Been Made

2009  JICMS launches Strategic Business Plan
2009  Cooperative Agreement signed with GVI
2009  Park haul road cleared
2009  DOI/OIA provides $1.25 million to support MREC design (OIA total >$2 million)
2010  VI National Guard commits $1.4 million for site restoration
2010  Concept presented to NPS
Broadening the MREC Concept

Marine and Non-Marine Elements

- Museum Collections Facility (NPS)
- Archeological Field School
  - Program to kick off in May 2011
- Opportunities for students to take full semester of classes, including courses taught at UVI
- Visiting faculty/use of other facilities integrated into facility design and curriculum program
Local USVI Synergies and Linkages

- Improved collaboration among GVI, UVI, DOI (NPS, USGS, FWS), NOAA
- A capacity building project for VI
  - More data and information for local resource management
  - Strengthening K-12 environmental sciences & discovery experiences
  - Increased opportunities for research for VI students & faculty
  - Facility example of “green-construction” and sustainability
- Increased opportunities for collaborative research with JICMS partners
JICMS Work Teams

✦ **Curriculum Committee**
- Designing educational programs components

✦ **Local Outreach**
- Engaging students, local educators, environmental groups, and the public as the facility is being designed
- Local JICMS/UVI presence on St. Croix

✦ **Seawater Team**
- Designing the Optimal System
- Water quality monitoring in Salt River Bay
- Interaction with NPS on site/park issues; will affect design
Potential Locations of Seawater Intake

<table>
<thead>
<tr>
<th>Site</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>14'</td>
</tr>
<tr>
<td>2</td>
<td>12'</td>
</tr>
<tr>
<td>3</td>
<td>6'</td>
</tr>
<tr>
<td>4</td>
<td>6'</td>
</tr>
<tr>
<td>5</td>
<td>15'</td>
</tr>
<tr>
<td>6</td>
<td>46'</td>
</tr>
</tbody>
</table>
Rutgers Student Site Design Concepts

View from east to west side of site - houses on mountain are tiny but still visible.

Cruise people's involvement at this point.

Kayak trip @ 5:30 pm

Experiencing St. Croix from the water. Hide shaky attachment to St. Croix.

* Water views from.
* Landscape to look pr.
* Connections & RE.
* Hotel, archaeological.

Boundary: criteria - building of 2025.
* LEED Platinum sustainable, earthquake resistant.
* Single story, W/ pump.
* Use wind and solar.

* How to combine modern with ancient cultural landscape by...}

* Indiana: ancient cultural feature like powerline.

* Dealing with invasive plants like grass.

* Sandy Hills Farm - representative, competitive presentation of farm's intent. No mention of including people's involvement at this site.
International Sustainable Laboratory
Student Design Competition

✦ Being planned by:
  ○ International Institute of Sustainable Laboratories (I²SL)
  ○ Joint Institute for Caribbean Marine Studies (JICMS)
  ○ In collaboration with the Association of Collegiate Schools of
    Architecture (ACSA)

✦ Students will submit designs for the MREC

✦ The competition will:
  ○ Enable architecture and engineering students from around
    the world to provide new and innovative thinking for the
    creation of energy-efficient and environmentally sustainable
    laboratories.
  ○ Elevate both student and industry awareness of sustainable
    laboratories.
  ○ Provide useful insights for the MREC project that may be
    incorporated into the final design.
### Competition Schedule

<table>
<thead>
<tr>
<th>Time Frame</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring 2011</td>
<td>Competition promotion continues. Faculty prepare to incorporate competition into 2011–2012 academic year semester classes.</td>
</tr>
<tr>
<td>Fall 2011</td>
<td>Competition registration begins. First semester of classes related to competition begins. Competition promotion continues.</td>
</tr>
<tr>
<td>Summer – Fall 2012</td>
<td>Winners announced at the AIA National Convention and awards presented at the Labs21 2012 Annual Conference. Winning entries promoted.</td>
</tr>
<tr>
<td>Winter 2012</td>
<td>All submissions posted to I²SL's website.</td>
</tr>
</tbody>
</table>
Conceptual Design
Completing the Conceptual Design

✦ Programming

✦ Refine building program and design facility to secure NPS approval and create vision to share with funders

✦ Lord Aeck Sargent of Atlanta selected as contractor

✦ Process kicked off in December 2010, wraps up in May for presentation to NPS in July 2011

✦ Addressing Sustainability

✦ Site & Master Planning

✦ Renderings of Design Concepts
# Program Summary

## MREC Space Summary

<table>
<thead>
<tr>
<th>Program Summary</th>
<th>Description</th>
<th>Total NSF</th>
<th>Total GSF</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>Lab and Lab Support</td>
<td>9728</td>
<td>14966</td>
</tr>
<tr>
<td>2.0</td>
<td>Building Administration</td>
<td>2654</td>
<td>3338</td>
</tr>
<tr>
<td>3.0</td>
<td>Lecture and Teaching</td>
<td>2752</td>
<td>4234</td>
</tr>
<tr>
<td>4.0</td>
<td>Community Outreach</td>
<td>5,600</td>
<td>8,615</td>
</tr>
<tr>
<td>5.0</td>
<td>Living Accomodations</td>
<td>11,770</td>
<td>18,108</td>
</tr>
<tr>
<td>6.0</td>
<td>Boat Dock</td>
<td>2,300</td>
<td>3,067</td>
</tr>
<tr>
<td>7.0</td>
<td>Maintenance Bldg</td>
<td>3,800</td>
<td>6,441</td>
</tr>
<tr>
<td>Building Total:</td>
<td></td>
<td>38,604</td>
<td>58,768</td>
</tr>
<tr>
<td>8.0</td>
<td>Site Support</td>
<td>21,650</td>
<td>25,471</td>
</tr>
<tr>
<td>9.0</td>
<td>Site</td>
<td>12,000</td>
<td>13,333</td>
</tr>
<tr>
<td>Site Total:</td>
<td></td>
<td>33,650</td>
<td>38,804</td>
</tr>
</tbody>
</table>
Passive Survivability

A building’s ability to “maintain critical life-support conditions in the event of extended loss of power, water, etc.”

- Cooling-load avoidance
- Natural ventilation
- Efficient envelope
- Passive solar heating
- Natural daylighting
- Onsite water collection and storage
- Onsite renewable energy and storage
- Solar hot water
- Historic vernacular design solutions
Building Orientation

East-West Orientation

North-South Orientation
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Environmental Issues on STX

✦ Air Quality
  o One of 10 largest oil refineries in the world
  o Electricity generation from diesel

✦ Sewage
  o Discharge of raw municipal sewage
  o Failing Septic Systems

✦ Erosion & Sedimentation
  o Development pressure and Poor soils

✦ Limited Fresh Water
  o Groundwater
  o Rainwater
  o Desalinization

✦ Electricity Supply
  o Intermittent and expensive
Measuring Sustainability

- Living Building Challenge
- LEED Platinum
- Island Green Building Checklist
- Labs21 Environmental Performance Criteria
<table>
<thead>
<tr>
<th>Site</th>
<th>LEED BD+C</th>
<th>Labs21 Environmental Performance Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Limits to growth</td>
<td>Site selection, Density/connectivity, Brownfield, Alternative transportation, Development, Stormwater, Heat island, Light pollution</td>
<td>Air effluent management</td>
</tr>
<tr>
<td>2. Urban Agriculture</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Habitat Exchange</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Car Free Living</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Net zero water</td>
<td>Irrigation</td>
<td>Lab equipment water use</td>
</tr>
<tr>
<td>6. Ecological water flow</td>
<td>Wastewater</td>
<td>Process water efficiency</td>
</tr>
<tr>
<td>Energy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Net zero energy</td>
<td>Commissioning, Refrigerants, Energy efficiency, Renewable energy, M&amp;V, Green power</td>
<td>Lab ventilation assessment</td>
</tr>
<tr>
<td>Materials</td>
<td></td>
<td>Lab equipment efficiency</td>
</tr>
<tr>
<td>11. Red list</td>
<td>Recycling, Building reuse, Waste mgmt., Reuse, Recycled, Regional, Rapidly renewable, Certified wood</td>
<td>Hazardous materials handling</td>
</tr>
<tr>
<td>12. Embodied carbon footprint</td>
<td></td>
<td>Chemical management</td>
</tr>
<tr>
<td>13. Responsible industry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Appropriate sourcing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Conservation + reuse</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IEQ/Health</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Civilized environment</td>
<td>Ventilation, Non-smoking, CO2 monitoring, IAQ management, Low-emitting materials, Source control, Controllability of systems, Thermal comfort, Daylight and views</td>
<td>Lab ventilation</td>
</tr>
<tr>
<td>9. Healthy air</td>
<td></td>
<td>Protection and notification</td>
</tr>
<tr>
<td>10. Biophilia</td>
<td></td>
<td>Lab air flow analysis</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>Containment Cx</td>
</tr>
<tr>
<td>16. Human scale + humane places</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Democracy + social justice</td>
<td></td>
<td></td>
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<tr>
<td>18. Rights to nature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beauty</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Beauty + spirit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Inspiration + education</td>
<td></td>
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</tr>
</tbody>
</table>
Deep Green: Regenerative Buildings

Living Building Challenge

- Do Good, not “Less Bad”
- Net Zero Energy Use Annually
- New Zero Water Use Annually
- Designers and Owners required to fundamentally rethink assumptions and processes
Deep Green:  
Regenerative Buildings

MREC Design:

✦ Project will collect all of its potable water from rain
✦ Project will treat all waste water on site and reuse it
✦ Project will provide all required power on site (PV/wind) with battery backup
✦ Project will create comfortable spaces without conventional mechanical systems (natural ventilation, dehumidification)
Deep Green: Regenerative Buildings

MREC Strategies

- Climatically and culturally appropriate designs that take advantage of plentiful resources (sun and wind) and value use of precious ones (water)
- Be a model of sustainable construction to teach and encourage others
Objective: *Comfort*, Not Temperature

- Evaporation $\sim 20\%$ (influenced by humidity)
- Convection $\sim 35\%$ (influenced by air temp/speed)
- Radiation $\sim 45\%$ (influenced by surface temperatures)
Solar/PV
Windspire wind turbine in St. Croix, US VI

Wind
For More Information

 предпочитительные сайты:

❖ [www.jicms.org](http://www.jicms.org)
❖ [www.i2sl.org](http://www.i2sl.org)
❖ [www.acsa-arch.org](http://www.acsa-arch.org)
❖ [stcroix.rutgers.edu](http://stcroix.rutgers.edu)
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