Lowcountry Military Resilience

OLDCC MIRR REGIONAL COLLABORATION FORUM
DECEMBER 16, 2021
Beaufort County

Located in the heart of the Lowcountry—a coastal region named for the fact that most of its land sits just above sea level.

- 576 square miles approximately 40 miles north of Savannah and 75 miles south Charleston
- Municipalities: City of Beaufort & Towns of Bluffton, Hilton Head Island, and Port Royal
- Several Sea Islands (low-lying barrier islands separated by wide expanses of marshland and creeks)
- Uplands of Beaufort County are low: two-thirds of these areas are within the 100-year flood zone designated by the Federal Emergency Management Administration (FEMA)
- Economy includes several resorts, retirement communities and the presence of two thriving Marine Corps installations
- Population has grown rapidly in recent decades
MCAS Beaufort
- 6,949 acres
- 971 acres of Family Housing
- 13 Miles north of MCRD Parris Island

MCRD Parris Island
- 8,096 acres
- 4,833 acres of salt marsh
- Access via causeway
Long-Running Multi-Party Planning Relationship

- First Joint Land Use Study (JLUS) 2004 — Beaufort Air Station
- Second JLUS completed in 2015 for both MCAS and MCRD

- Protect health and safety of residents living or working near military installations;
- Preserve and promote long-term land use compatibility between installation and surrounding community and reduce operational impacts on adjacent lands.
- Integrate local jurisdictions’ comprehensive plans and implementing ordinances and codes with those land use compatibility recommendations and consistently with each other;
- Encourage continuation of cooperative spirit and good relations between local base command and local community officials.
- Increase public awareness of the military missions and contribution to the regional economy.
- Protect and preserve military readiness and defense capabilities while supporting continued community economic development.
Sea Level Rise Study

Recommendation of 2015 JLUS for MCAS Beaufort and MCRD Parris Island

Identify infrastructure problems and determine how to minimize or mitigate effects to ensure needs of both local communities and military facilities are met.

- In Beaufort area, water and sewer services are provided to the military facilities by the same regional provider that serves the community
- Majority of active duty, dependents and retirees are served at regional community hospital
- Majority of the housing is off base
- Local roads, highways and bridges provide the only access to MCAS Beaufort and MCRD Parris Island.
Sea Level Rise
Infrastructure Impacts
project Overview

What it is:
An initial assessment of the potential costs/techniques to adapt infrastructure for present and future potential tidal flooding to maintain functionality of the local bases.

What it is not:
• Not a Storm/FEMA inundation study
• Not looking at house/building flooding or green infrastructure/habitats
Percentage of Infrastructure Considered Highly Vulnerable
Based on Exposure, Sensitive and Adaptive Capacity

- **Transportation — HIGH**
  - Roadway overtopping & standing water — hydroplaning, stalling vehicles
  - Undermining and erosion leading to washout of embankments
  - Complete washout of roadway
  - Accelerated deterioration of bridge superstructures.
  - Undermining of bridge substructure due to channel bottom scour
  - Stormwater — highly sensitive
  - Surcharging of storm drainage piping, culverts and catch basins.

- **Storm Water — HIGH**
  - Surcharging of pipes and overflowing of grate inlets and catch basins.
  - Full pipe flow condition causing pressure and failure of joints between concrete pipe.
  - Saturation of supporting soils leading to collapse and joint separation.
  - Scour and undermining of outfall structures, headwalls, etc.

- **Water Utilities — MODERATE TO LOW**
  - Potential increased of salinity in water source
  - Undermining of buried pipe lines
  - Saturation of soils and corrosion of pipe lines
  - Infiltration of gravity sewers
  - Flooding of wet wells
  - Damage to lift station pumps
## Costs for Adaptive Measures

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Cost</th>
<th>Transportation</th>
<th>Stormwater</th>
<th>Water Utilities</th>
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<td>2030</td>
<td>$196,942,054</td>
<td>$193,250,346</td>
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<td>2040</td>
<td>$257,377,025</td>
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<td>2060</td>
<td>$467,192,639</td>
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</table>

- Costs reflect the generic handing of retrofits.
- Does not reflect systematic gains – higher level engineering required.
- Costs highlight the need to perform strategic cyclical maintenance (managed adaptive approach) during normal course of business.
Lowcountry Military Installation Resilience Review

BEAUFORT AIR STATION
PARRIS ISLAND RECRUIT DEPOT

KICKOFF MARCH 2021
Purpose

Develop strategies to protect resources necessary to enhance resilience of military installations

Not all hazards can be contained but is possible to plan and make changes in physical structures and in procedures in order to prevent damage and stay on mission.
Project

1. Probability Assessment of Hazards – of current and expected environmental changes in the communities surrounding the bases

2. Vulnerability Assessment of Infrastructure – roads, bridges, sewer, water, power, health, education and other social services

3. Recommendations – what changes and improvements to the area’s infrastructure are needed

4. Implementation – how to realistically implement recommendations to ensure bases are able to continue their operations
Consultant Team

Layered Expertise:
- Existing Knowledge
- Infrastructure
- Natural Systems
- Funding
- Communication

SHERWOOD DESIGN ENGINEERS
TEAM LEAD | PROJECT MANAGEMENT | ENGINEERING

TOM JOST
PRINCIPAL IN CHARGE

JIM REMLIN, PE, LEED AP
PROJECT MANAGER | MAIN POINT OF CONTACT

EXISTING CONDITION | VULNERABILITY ASSESSMENT | POLICY

EXISTING CONDITION | VULNERABILITY ASSESSMENT | POLICY

GEOSCIENCE
KEIL SCHMID
COASTAL GEOLOGIST

ENSAFE
DAVID CRISWELL
QUALITY ASSURANCE

WHITE SMITH
PLANNING & LAW
TYSON SMITH
LAND USE PLANNER

PLANNING | DESIGN | ENGAGEMENT

BIOHABITATS
KEITH BOWERS
LANDSCAPE ARCHITECTURE

ONE ARCHITECTURE
TRAVIS BUNT
RESILIENT & CLIMATE
## Stakeholders

<table>
<thead>
<tr>
<th>Agency</th>
<th>Agency</th>
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<tr>
<td>BJWSA</td>
<td>SCDOT</td>
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<tr>
<td>Coastal Community Foundation</td>
<td>Beaufort Chamber Military Enhancement Committee</td>
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<tr>
<td>Lowcountry Institute/Spring Island Trust</td>
<td>Beaufort Conservation District</td>
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<tr>
<td>Beaufort Memorial Hospital</td>
<td>Beaufort Regional Chamber</td>
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<td>Beaufort County Human Services</td>
<td>Port Royal Sound Foundation</td>
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<td>Beaufort County</td>
<td>Gullah/Geechee Nation</td>
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<tr>
<td>Planning Commission/Port Royal Sound Foundation</td>
<td>Town of Port Royal</td>
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<tr>
<td>Southern Carolina Alliance</td>
<td>City of Beaufort</td>
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<td>Beaufort County Transportation Committee</td>
<td>SCDNR/ACE Basin</td>
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<tr>
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<td>Beaufort Regional Chamber</td>
<td>SCDNR/Shellfish Management</td>
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<td>Metropolitan Planning Commission</td>
<td>The Nature Conservancy</td>
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Approach Framework

1. Identify & Define
   - Data Collection
   - Threat Analysis
     - Community Readiness
     - Emergency Response
     - Critical assets
     - Vital resources
     - Extreme Weather
     - Man-made hazards
     - Infrastructure needs

2. Assess Vulnerability & Risk
   - Current and Future Development Patterns
   - Prepare - Response - Recovery
     - Vulnerabilities to Hazards
   - Timescales of vulnerabilities and risk
     - Short Term (1-3 years)
     - Medium-Term (4-10 years)
     - Long-Term (11-20 years)

3. Refine + Prioritize
   - Projects and Policies
     - Opportunity costs
     - Responsible parties
     - Timelines
   - Estimated costs
     - appropriate financing mechanisms
     - Monitoring plan
     - Organizational structure

THREATS, IMPACTS, AND UNMET NEEDS

Vulnerability Assessment

MAPS

Priority Assessment

COMMUNITY RESILIENCE PLAN

PROJECTS

RESPONSIBLE PARTIES

TIMELINE

WE ARE HERE

Identify & Define

Assess Vulnerability & Risk

Refine + Prioritize

Data Collection

Threat Analysis

Community Readiness

Emergency Response

Critical assets

Vital resources

Extreme Weather

Man-made hazards

Infrastructure needs

Opportunity costs

Responsible parties

Timelines

appropriate financing mechanisms

Monitoring plan

Organizational structure
TASK 1
COMPOUND THREATS

1. Sea level rise causes marsh migration, tidal flat formation and fills channels.
2. Stormwater runoff no longer has available channel storage leading to local flooding.
3. Hurricane winds drive ocean waves inland causing erosion and additional flooding.

INFRASTRUCTURE IMPACTS

CIRCULATION IMPACTS

SLR-DRIVEN MARSH MIGRATION

COMPOUND FLOODING

COASTAL EROSION

CLUSTER

THREAT (PATTERN)

THREAT (PATTERN)

THREAT (PATTERN)
Coastal Texture

Regional Drivers

Global Patterns

Local Tidal Dynamics

Regional Aquifer Sensitivities
Evidence of Shoreline Change

Increased Tree Deaths
Limited Access in High Tide

Monthly Mean Sea Level (MSL) has been rising since early 1900s

Mapping Coastal Erosion Hazards Along Sheltered Coastlines in South Carolina
1852 to 2006
NOTE: The accuracy for pluvial flood model is bound to the coastal side of major highways.
TASK 3
PILOT PROJECTS TO ANALYZE

Transect 1 (Urban)  Transect 2 (Suburban)  Transect 3 (Rural)
<table>
<thead>
<tr>
<th>Military Asset or Service</th>
<th>Community Asset or Service</th>
<th>Sunny Day Flood</th>
<th>Storm Surge</th>
<th>Matthew Extents</th>
<th>Pluvial Flood</th>
<th>Marsh Loss</th>
<th>Erosion Hotspots</th>
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<td>Parris Island Access</td>
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<td>Sewer Lift Station</td>
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<td><strong>Rural:</strong></td>
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<td>St Helena WWTP</td>
<td>Potable Water withdrawals</td>
<td>Wastewater treatment and Non-potable irrigation</td>
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- Stabilize Shoreline
- Mitigate Tidal Impacts
- Improve Stormwater Storage
- Improve Emergency and Day to day access

Legend
- Coastal Erosion
- Marsh Loss
- Compound Coastal Flood
- Pluvial Flood
- Stormwater Piping
Pilot Project 2
Sub-Urban Typology: Ladys Island
Star Magnolia Subdivision

- Elevate buildings
- Improve drainage conveyance and storage
- Protect Sewer Lift Station

Legend
- Marsh Loss
- Compound Coastal Flood
- Pluvial Flood
- Sewer Lift Station
Pilot Project 3

Rural Typology: St Helena WWTP

- Improve Drainage and Protection for WasteWater Treatment Plan
- Connect parcels on septic to WWTP
- Retrofit plant for Non-Potable supply of Treated Wastewater

Legend
- Compound Coastal Flood
- Pluvial Flood
- WWTP
- Treated Wastewater Outfall
- Shellfish Monitoring Location
Schedule & Next Steps

10/21

Policy Committee

Site Visit/Engagement

Technical Committee

Week 1

Assets
Develop maps including additional data

Vulnerability
Sensitivity
Adaptive Capacity
Exposure

CONIRM

Week 2

Week 3

Week 4

Week 5

Week 6

Week 7

CONFIRM

PILORITIZE

CONCEPTUALIZE

October

November

December

Policy Committee

Site Visit/Engagement

Recommended Actions
Projects, Policies, Organizational Structure

Identify Phasing, Responsible Parties and Funding Mechanisms

Clusters
Identifying Areas with Compounding Threats

Pilots
Areas with Replicable Typologies and High Vulnerability

Assets
Develop maps including additional data

Vulnerability
Sensitivity
Adaptive Capacity
Exposure

Identifying Areas with Compounding Threats

Week 6

Week 7

Recommended Actions
Projects, Policies, Organizational Structure

Identify Phasing, Responsible Parties and Funding Mechanisms

Potential Actions

Pilots
Areas with Replicable Typologies and High Vulnerability

Week 5

Week 6

Week 7

Week 4

Week 5

Week 6

Week 7

Cluster
Identifying Areas with Compounding Threats

Pilots
Areas with Replicable Typologies and High Vulnerability

Week 6

Week 7

Week 1

Week 2

Week 3

Week 4

Week 5

Week 6

Week 7

CONFIRM

PILORITIZE

CONCEPTUALIZE

October

November

December
Append Zoning/Transect Classifications to Risks and Elevation
Digital Engagement Approach
PILOT PROJECTS TO ANALYZE

Transect 1 (Urban)  Transect 2 (Suburban)  Transect 3 (Rural)

Predicted SCF 5 Nov 2021

[Map showing locations and areas of interest]
Contact

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Lowcountry Council of Governments

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