

COUNTY COUNCIL OF BEAUFORT COUNTY
ADMINISTRATION BUILDING
BEAUFORT COUNTY GOVERNMENT ROBERT SMALLS COMPLEX

100 RIBAUT ROAD
POST OFFICE DRAWER 1228
BEAUFORT, SOUTH CAROLINA 29901-1228

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www.bcgov.net

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VICE CHAIRMAN

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COUNTY ADMINISTRATOR

JOSHUA A. GRUBER
DEPUTY COUNTY ADMINISTRATOR
SPECIAL COUNSEL

THOMAS J. KEAVENY, II
COUNTY ATTORNEY

SUZANNE M. RAINEY
CLERK TO COUNCIL

AGENDA
NATURAL RESOURCES COMMITTEE

Monday, January 4, 2016

2:00 p.m.

Executive Conference Room, Administration Building
Beaufort County Government Robert Smalls Complex
100 Ribaut Road, Beaufort

Committee Members:

Brian Flewelling, Chairman
Alice Howard, Vice Chairman
Gerald Dawson
Steve Fobes
William McBride
Jerry Stewart
Roberts "Tabor" Vaux

Staff Support:

Anthony Criscitiello, Planning Director
Gary James, Assessor
Eric Larson, Division Director
Environmental Engineering
Dan Morgan, Division Director
Mapping & Applications

1. CALL TO ORDER – 2:00 P.M.
2. CONSIDERATION OF CONTRACT AWARDS AND RECOMMENDATIONS
 - A. Request for Qualifications to Provide Engineering and Consulting Services for the 2015 Okatie West Regional Stormwater BMP, a CWA Section 319 Grant Project ([backup](#))
 - B. Recommendation to Allow County Administrator to enter into Agreement with Academy Park, LLC for a Partnership to Develop a Regional Stormwater Facility in the Rock Springs Creek Watershed
([memorandum to committee academy park and rock springs creek](#))
([factory creek m2 sub-basin at apllc](#))
([factory creek feasibility study \(samples property\)](#))
([concept plan academy park rock springs creek basin phase 1](#))
([academy park draft memorandum of agreement](#))
 - C. Acknowledgement of Receipt of the Beaufort County Sea Level Rise Adaption Report Prepared as a Grant Project by the SC Sea Grant ([executive summary](#)) ([report](#))
3. UPDATE ON STORMWATER UTILITY FEE BILLING, QUESTIONS, ISSUES, NEEDED ADJUSTMENTS, ETC. ([backup](#))
4. SOUTHERN BEAUFORT COUNTY MAP AMENDMENT/REZONING REQUEST FOR R600-013-000-0061-0000 (20+/- ACRE PORTION, FORMERLY KNOWN AS OKATIE MARSH PLANNED UNIT DEVELOPMENT, ON S.C. HIGHWAY 170 BETWEEN HEFFALUMP AND PRITCHARD POINT ROADS) FROM T1 (NATURAL PRESERVE) TO T2R (RURAL); OWNER/APPLICANT: BEAUFORT COUNTY ([backup](#))



5. DISCUSSION OF THE YEAR IN REVIEW FOR THE COMMUNITY DEVELOPMENT CODE
6. CONSIDERATION OF REAPPOINTMENTS AND APPOINTMENTS
 - A. Design Review Board
 - B. Planning Commission
 - C. Rural and Critical Lands Preservation Board
 - D. Stormwater Management Utility Board
 - E. Zoning Board of Appeals
7. ADJOURNMENT



COUNTY COUNCIL OF BEAUFORT COUNTY

PURCHASING DEPARTMENT

106 Industrial Village Road, Building 3

Post Office Drawer 1228

Beaufort, South Carolina 29901-1228

TO: Councilman Brian Flewelling, Chairman, Natural Resources Committee

FROM: Dave Thomas, Purchasing Director *DT*

SUBJ: RFQ # 11302015 Request for Qualifications to Provide Engineering and Consulting Services for the 2015 Okatie West Regional Stormwater BMP, a CWA Section 319 grant project

DATE: January 4, 2016

BACKGROUND: Beaufort County Purchasing Department issued a Request for Qualifications (RFQ) for engineering and consulting services for the 2015 Okatie West Regional Stormwater BMP, a CWA Section 319 grant project. The proposal requested that the vendor consultant provide services to design and oversee construction of a regional stormwater best management practice. The Evaluation Committee consisted of five (5) staff members representing the County: Eric Larson - Stormwater Management; Rebecca Baker - Stormwater Management; Danny Polk - Stormwater Management; Andrea Atherton - Engineering; and Chanel Lewis - Finance. Beaufort County received five (5) responses to the RFQ. They reviewed and evaluated all RFQs, and decided to interview three (3) vendors listed below; Ward Edwards Engineering was selected and ranked the number one (1) firm. The final ranking is as follows:

1. Ward Edwards Engineering, Bluffton, SC (Interviewed)
2. Four Waters Engineering, Jacksonville, FL (Interviewed)
3. McCormick Taylor, Charleston, SC (Interviewed)
4. Thomas and Hutton Engineering, Savannah, GA
5. Andrews Engineering, Beaufort, SC

During the December 18, 2015 Stormwater Management Utility Board Meeting, the board voted unanimously to recommend the contract to Ward Edwards Engineering for the \$109,473 scope of services.

The term of the contract will be effective January 12, 2016 to December 31, 2019, approximately 48 months (the term of the grant contract with DHEC). Contract fees for the project were negotiated with Ward Edwards Engineering, with the results attached to this recommendation.

DT **FUNDING** Primary Funding - 50250011-51160, Stormwater fees. (\$110,000 Budget)

PROPOSED COST: \$109,473

FOR ACTION: Natural Resources Committee meeting January 4, 2016.

RECOMMENDATION: The Purchasing Department recommends that the Natural Resources Committee approve and recommend to County Council approval of the contract award of \$109,473 to Ward Edwards Engineering for Engineering and Consulting Services for the 2015 Okatie West Regional Stormwater BMP, a CWA Section 319 grant project.

ATTACHMENTS:

Draft Contract
Fee Schedule
Fee Breakdown
Projected Project Schedule
Selection Summary

CC: Gary Kubic, County Administrator
Joshua Gruber, Deputy County Administrator/Special Counsel *JG*
Alicia Holland, Assistant County Administrator, Finance *AH*
Monica Spells, Assistant County Administrator, Civic Engagement and Outreach
Don Smith, Chairman, Beaufort County Stormwater Board
Eric W. Larson, Division Director for Environmental Engineering *Eric W. Larson*

CONTRACT

THIS CONTRACT is made this January 12, 2016, by and between Beaufort County, a political subdivision of the State of South Carolina (hereinafter referred to as "County") and Ward Edwards, Inc. (hereinafter referred to as "Contractor"). This Contract shall consist, by reference of all the terms, conditions, scope of work, specifications and provisions contained in RFQ Number 1130015 dated November 30, 2015 (advertised in The Island Packet/Beaufort Gazette on October 30, 2015, Addendum dated November 18, 2015 and Contractor's Response dated November 30, 2015.

WITNESSETH:

WHEREAS, the Contractor and the County desire to enter into this contract relating Engineering and Consulting Services for the Engineering and Consulting Services for 2015 Okatie West Regional Stormwater BMP, a Clean Water Act (CWA) Section 319 Grant Project subject to the terms, specifications, conditions and provisions of the request for proposal as heretofore mentioned.

NOW, THEREFORE, the Contractor and the County agree to all of these terms, conditions, specifications, provisions and the special provisions as listed below:

- A. This Contract is deemed to be under and shall be governed by and construed according to the laws of the State of South Carolina.
- B. Any litigation arising out of this Contract shall be held only in a circuit court of Beaufort County, Beaufort, South Carolina in the Fourteenth Judicial Circuit.
- C. The Contractor shall not sublet, assign, nor by means of a stock transfer sale of its business, assign or transfer this Contract without the written consent of the County.
- D. This Contract, including the terms, conditions, specifications and provisions listed herein makes up the entire contract between the Contractor and County. No other Contract, oral or otherwise, regarding the subject matter of this Contract shall be deemed to exist or bind either party hereto.
- E. It is understood that this Contract shall be considered exclusive between the parties.
- F. Any provisions of this Contract found to be prohibited by law shall be ineffective, to the extent of such prohibition, without invalidating the remainder of this Contract.

NOW, THEREFORE, in consideration of the mutual covenants contained herein, the

parties agree as follows:

ARTICLE 1 BACKGROUND/SCOPE OF WORK

Background

The Contractor will have access to previous studies and plans related to the project to provide technical resources of the design, conceptual design options, and summaries of intended results. Documents include but are not limited to:

- 2002 Okatie River Watershed Management Plan
- 2011 Regional Retrofit Study
- 2014 SC170 Highway Widening Retrofit Study (made available upon request)
- 2015 Okatie River Watershed Management Plan update
- 2015 CWA Section 319 Grant application

These documents are available on the County's stormwater website, <http://www.bcgov.net/departments/Engineering-and-Infrastructure/stormwater-management/>, unless otherwise noted.

In addition, the County Stormwater Department has on-going water quality sampling and flow monitoring at the project site. This data will be made available to calibrate the design to meet measured flows and pollutant levels.

Scope of Work

The Contractor will provide a detailed Scope of Work needed to design and construct a regional stormwater best management practice in addition to managing the grant contract for the CWA Section 319 grant awarded to the project. A summary of the Scope of Work is as follows:

- Provide expertise in managing CWA Section 319 grant contract administration, including reporting, reimbursement requests, schedule modifications, communications with SC-DHEC, close-out documentation, and other tasks typically required by a grant. The Consultant will be advising and assisting the County related to grant administration.
- Prepare needed field survey necessary for the design of the retention basin.
- Prepare needed wetland delineations required by USACE as part of the project.
- Prepare a hydrologic and hydraulic design for the retention basin.
- Model pollutant removal and volume control expected for the project to assure they meet the intent of previous watershed plans and the grant goals.
- Geotechnical investigations, as needed.
- Prepare a final design for construction documents.
- Prepare, submit, and manage all needed permits from the USACE, SC-DHEC/OCRM, the County's Zoning department, the Town of Bluffton, and others.
- Prepare bid package for construction.
- Oversee the bidding process, evaluating and recommending a successful Contractor.
- Provide construction oversight, periodic inspections, and manage documentation during construction.

- As-built surveys as required for permits and Grant conditions.
- Prepare public educational outreach materials and presentations for various focus groups including residents of Sun City and the engineering/development community, as required by the Grant agreement.
- Provide graphics and content for educational signage on the project. Coordinate fabrication and installation of the sign.
- Other items needed to complete the goal yet not specifically listed above will also be the responsibility of the Consultant and will be outlined during the contract negotiation phase.

Cost

Cost Estimate

- See Attachment "A" for detailed breakdown of hourly rates and fees to be applied to the effort outlined for each task in this Scope of Work.

•

Total: \$109,473.00

It is understood that the exact effort needed to complete this Scope of Work may vary depending upon the results of various County meetings. The County and the Contractor agree that the Contractor will track the overall cost of each Task and will advise the County in writing PRIOR TO exceeding the maximum cost not to exceed for each Task. This Scope of Work may be modified in the future by mutual agreement of the County if needed to re-allocate fees among these tasks or to adjust the maximum cost not to exceed.

ARTICLE 2 LIABILITY

The County and Contractor shall not be responsible to each other for any incidental, indirect or consequential damages incurred by either Contractor or County or for which either party may be liable to any third party which damages have been or are occasioned by services performed or reports prepared or other work performed hereunder.

ARTICLE 3 INDEMNIFICATION AND HOLD HARMLESS

The Contractor does hereby agree to indemnify and save harmless the County, its officers, agents and employees from and against any and all liability, claims, demands, damages, fines, fees, expenses, penalties, suits, proceedings, actions and cost of actions, including attorney's fees for trial and on appeal of any kind and nature to the extent arising or growing out of or in any way connected with the negligent performance of the Contract, by Contractor, its agents, servants or employees.

ARTICLE 4 ASSIGNMENT

Contractor shall not assign any rights or duties of the professional services contract without the expressed written consent of the County. Any assignment or subletting without the

written consent of County shall be void and this Contract shall terminate at the option of the County. It is agreed and understood by the County that the Contractor has partnered with Atlas Surveying Inc. (Atlas), Sligh Environmental Consultants, Inc. (SECI), Brockington & Associates, Inc. (B&A), and ECS Southeast, LLC (ECS) to provide certain sub-contracted professional services to the Contractor for the life of this Contract.

ARTICLE 5 PERFORMANCE PERIOD/TERM

The term of the contract will be effective January 12, 2016 to December 31, 2019, approximately 48 months (the term of the grant contract with DHEC). At the County's option, this contract may be renewed for one (1) additional one-year term.

ARTICLE 6 COMPENSATION

Article 1 includes the agreed upon compensation for the Contractor for the Scope of Work to be performed under this Contract. Hourly rates for Professional staff and reimbursement for expenses and sub-consultant costs will be as stated in the fee structure provided in the **Contractor's Fee Schedule dated December 16, 2015**. Work performed on this Contract will be accounted for separately by the Contractor and the County will be invoiced on a monthly basis for work performed under this Contract. Payments will be made as outlined in Article 17.

ARTICLE 7 INSURANCE

Insurance

Contractor does hereby covenant, agree and hereby represent to the County that it has obtained workmen's compensation insurance, general liability and automobile liability insurance, as well as providing coverage against potential liability arising from and in any manner relating to the Contractor's performance of the Scope of Work contained in this Contract. Additionally, the Contractor agrees to list the County as 'additional insured' on Certificates of Insurance related to the execution of this Contract.

ARTICLE 8 DEFAULT / TERMINATION

Default

In the event of default or breach of any condition of this Contract resulting in litigation, the prevailing party would be entitled to reasonable attorneys' fees fixed by the Court. The remedies herein given to County under Default shall be cumulative, and the exercise of any one remedy by the County shall not be to the exclusion of any other remedy.

Termination

This contract may be terminated by the County, 'for convenience' 'for cause,' or by 'by mutual consent' as described in RFP Section V Paragraph 6.0.

1. Termination for Convenience

The County may, without cause, terminate this contract in whole or in part at any time for its convenience. In such instance, an adjustment shall be made to the Contractor, for the reasonable

costs of the work performed through the date of termination. Termination costs do not include lost profits, consequential damages, delay damages, unabsorbed or under absorbed overhead of the Contractor or its subcontractors, and/or failure of Contractor to include termination for convenience clause into its subcontracts shall not expose the County to liability for lost profits in conjunction with a termination for convenience settlement or equitable adjustment. Contractor expressly waives any damages, delay damages, or indirect costs which may arise from County's election to terminate this contract in whole or in part for its convenience.

2. Termination For Cause

Termination by the County for cause, default, or negligence on the part of the Contractor shall be excluded from the foregoing provisions. Termination costs, if any, shall not apply. The thirty (30) days advance notice requirement is waived, and the default provision in this bid shall apply.

Reasons for Termination for Cause shall include but not limited to:

- a) Default as defined above,
- b) failing to make satisfactory progress in the prosecution of the contract
- c) endangering the performance of this contract
- d) criminal activity or misconduct,
- e) work that is deemed sub-standard by the County Representative.

3. Termination by Mutual Consent

Either party may terminate this Contract by mutual consent with written notice attesting and agreeing to a termination by mutual consent by either party. Upon such termination, the County shall pay the Contractor for all services performed hereunder up through the date of such termination. Termination by mutual consent may entitle the Contractor to reasonable costs allocable to the contract for work or costs incurred by the Contractor up to the date of termination. The Contractor must not be paid compensation as a result of a termination by mutual consent that exceeds the amount encumbered to pay for the cumulative value of all approved Task Orders to be performed under the contract.

ARTICLE 9 RESPONSIBILITY

The County will be responsible to provide the Contractor reasonable access to County locations when necessary, ensure cooperation of County employees in activities reasonable and appropriate under the project, and obtain authorization for access to third party sites, if required.

ARTICLE 10 FORCE MAJEURE

Should performance of Contractor services be materially affected by causes beyond its reasonable control, a *Force Majeure* results. *Force Majeure* includes, but is not restricted to:

- a) acts of God,
- b) acts of a legislative,
- c) administrative or judicial entity,
- d) acts of Contractors (other than subcontractors of Contractor),
- e) fires,

- f) floods,
- g) labor disturbances,
- h) civil unrest
- i) incorrect/inferior parts or materials
- j) terrorism
- k) unusually severe weather.

Contractor will be granted a time extension and the parties will negotiate an adjustment to the fee, where appropriate, based upon the effect of the Force Majeure upon Contractor's performance.

ARTICLE 11 SEVERABILITY

Every term or provision of this Contract is severable from others. Notwithstanding any possible future finding by a duly constituted authority that a particular term or provision is invalid, void, or unenforceable, this Contract has been made with the clear intention that the validity and enforceability of the remaining parts, terms and provisions shall not be affected thereby.

ARTICLE 12 INDEPENDENT CONTRACTOR

The Contractor shall be fully independent in performing the services and shall not act as an agent or employee of the County. As such, the Contractor shall be solely responsible for its employees, subcontractors, and agents and for their compensation, benefits, contributions and taxes, if any.

ARTICLE 13 NOTICE

The Contractor and the County shall notify each other of service of any notice of violation of any law, regulation, permit or license relating to the services; initiation of any proceedings to revoke any permits or licenses which relate to such services; revocation of any permits, licenses or other governmental authorizations relating to such services; or commencement of any litigation that could affect such services. Such notice shall be delivered by U.S. mail with proper postage affixed thereto and addressed as follows:

County: Beaufort County
 Attn: Beaufort County Purchasing Director
 P. O. Drawer 1228
 Beaufort, SC 29901-1228

Contractor: Ward Edwards Inc.
 Allen B. Ward
 P.O. Box 381
 Bluffton, SC 29910

ARTICLE 14 CHANGE ORDERS

Should the Scope of Work as noted in Article 6 of this Contract change as a result of:

- a) County requested changes to the approved Scope of Work, or
- b) Increase in work needed to complete any approved Change Order as a result of unexpected occurrence outside of the control of the Contractor, or
- c) The County requests additional Change Orders from the Contractor

Then the Contractor will prepare and submit to the County an amendment to the applicable Change Order, or where no Change Order is in place of such additional services, the Contractor will prepare a Change Order for the County's review. No additional services will be undertaken by the Contractor without the approval of a Change Order or Change Order Amendment by the County.

ARTICLE 15 AUDITING

The Contractor shall make available to the County if requested, true and complete records, which support billing statements, reports, performance indices, and all other related documentation. The County's authorized representatives shall have access during reasonable hours to all records, which are deemed appropriate to auditing billing statements, reports, performance indices, and all other related documentation. The Contractor agrees that it will keep and preserve for at least seven years all documents related to the Contract, which are routinely prepared, collected or compiled by the Contractor during the performance of this contract.

The County's Auditor and the Auditor's authorized representatives shall have the right at any time to audit all of the related documentation. The Contractor shall make all documentation available for examination at the Auditor's request at either the Auditor or Contractor's office and without expense to the County.

ARTICLE 16 GRATUITIES

The right of the Contractor to proceed or otherwise perform this Contract, and this Contract may be terminated if the County Manager and/or the County Contracting Manager determine, in their sole discretion, that the Contractor or any officer, employee, agent, or other representative whatsoever, of the Contractor offered or gave a gift or hospitality to a County officer, employee, agent or Contractor for the purpose of influencing any decision to grant a County Contract or to obtain favorable treatment under any County Contract.

The terms "hospitality" and "gift" include, but are not limited to, any payment, subscription, advance, forbearance, acceptance, rendering or deposit of money, services, or items of value given or offered, including but not limited to food, lodging, transportation, recreation or entertainment, token or award.

ARTICLE 17

INVOICES

All invoices for work done under this Contract should be directed to the County Representative, Eric W. Larson, PE, CPSWQ, AICP, CFM – Director of Environmental Engineering

Located at: Beaufort County Stormwater Utility
120 Shanklin Road
Beaufort, S.C. 29906

Invoices should include:

- a) Period of time covered by the invoice
- b) Summary of work performed for the billing period
- c) Purchase order and Contract Number
- d) Tax Identification Number

Unless otherwise indicated, all invoices must be timely and accurate. The Contractor will make periodic requests for payment for this Contract and approved Change Orders. Invoices will be itemized by Scope of Work tasks and Change Order number.

ARTICLE 18 PURCHASE ORDERS

The County will issue Purchase Orders from properly executed requisitions for this Contract and each approved Change Order. The County shall not be responsible for invoices of \$500 or more that do not have a purchase order covering them.

ARTICLE 19 ORDER OF DOCUMENTS

The following are incorporated into and made a part of this contract by reference:

- a) Request for Qualifications Number 11302015
- b) Addendum dated November 18, 2015
- c) Ward Edwards Inc. Response to Beaufort County RFQ 11302015
- d) Ward Edwards Inc. Fee Structure dated December 16, 2015
- e) Recommendation Memo to County Council dated January 12, 2016

SIGNATURE PAGE

This Contract with the above Articles constitutes the entire contract between the parties hereto. No representations, warranties or promises pertaining to this Contract have been made or shall be binding upon any of the parties, except as expressly stated herein.

This Contract shall be construed in accordance and governed by the laws of the State of South Carolina.

IN WITNESS WHEREOF, the parties hereto have executed this Contract on the day and year first above written.

WITNESSES:

BEAUFORT COUNTY, a political sub-
division of the State of South Carolina

By: _____
Name: Gary Kubic
Title: County Administrator
Address: P.O. Drawer 1228
Beaufort, SC 29901-1228
Phone: (843) 255-2026
Fax: (843) 255-9403
Date: _____

WITNESSES:

WARD EDWARDS, INC

By: _____
Name: Allen Ward, PE
Title: Principal-in Charge
Address: P.O. Box 381
Bluffton, SC 29910
Phone: 843-837-5250
Fax: 843-837-2558
Tax ID Number: 57-0888952
Date: _____

Project Fees - Beaufort County RFQ 11302015: Okatie West Regional Stormwater BMP

Ward Edwards Project Number 090099B

December 16, 2015

Task	Principal	Project Manager	Project Engineer	Technician	Admin.	Surveyor	Wetland Scientist	Geotechnical	Senior Archaeologist 4	Senior Archaeologist 3		Fee
	\$165	\$135	\$125	\$110	\$85	(Fixed Fee)	\$125	(Fixed Fee)	\$78	\$70		
Manage CWA Section 319 Grant & Public Admin.	15	35			20							\$8,900
Wetland Delineation			2				12.8					\$1,850
Surveying :												
Tree, Topographic, & wetland survey		17				\$15,000						\$17,295
Boundary Survey		0			0	\$0						\$0
Hwy 170 Asbuilt for access		1			1	\$1,500						\$1,720
Wetland Channel Survey		3			2	\$3,500						\$4,075
Post Construction Asbuilt Survey		2		1		\$2,500						\$2,880
Wetland Verification (Jurisdictional Determination)			2		1		14.4					\$2,135
Cultural Resources		5							36	15		\$4,533
Geotechnical Testing		6						\$4,600				\$5,410
Preliminary Engineering		15	20	40								\$8,925
Wetland Agency Permitting		7			1		52					\$7,530
Final Engineering Design	8	20	60	80								\$20,320
Project Permitting		20	20	25	40							\$11,350
Bidding & Construction		20	10	60								\$10,550
Reimbursables (Budget)												\$2,000
										Total:		\$109,473

Excerpt From Okatie West Water Quality Grant Application Dated July 6, 2015

Projected Project Schedule		
#	Month	Milestone
1	Quarterly	Submit progress reports, invoices, MBE/WBE forms and BMP information per schedule outlined in grant agreement.
2	30 days after project completion	Submit final invoice and final technical closeout report to DHEC. Submit Final Budget Report within 45 days of project close.
3	Month 1	Public education workshop and site visit for nearby residents
4	Months 1-4	Project survey & initiate wetland verification update
5	Months 4-6	Preliminary Engineering
6	Months 6-27	Complete final design and update wetland verification
7	Months 27-33	Project regulatory permitting
8	At the start of construction	Erect signage at along Highway 170 informing the general public of the water quality BMPs purpose, benefit, and contribution of the Rural & Critical Lands program
9	Months 33-36	Construction procurement
10	Months 36-45	Construction
11	Months 45-48	Post Construction public education workshop and site visit for local developers & engineers
11	30 days after project completion	Submit final invoice and final technical closeout report to SCDHEC. Submit Final Budget Report within 45 days of project close

Okatie West consultant
 Proposal 11302015
 Summary of individual scoring of proposals
 Interviews 12082015

Criteria	Possible Points	Firms														
		Four Waters Engineering					McCormick Taylor					Ward Edwards Engineering				
		Atherton	Baker	Larson	Lewis	Polk	Atherton	Baker	Larson	Lewis	Polk	Atherton	Baker	Larson	Lewis	Polk
1. Demonstrated experience with stormwater best management practices design.	25	25	20	25	21	23	25	15	22	23	23	25	10	25	22	23
2. Working knowledge of computer based water quantity and water quality models.	20	20	20	20	20	18	15	15	20	17	19	15	20	20	17	19
3. Experience with CWA Section 319 grant project administration.	15	10	10	5	15	10	0	5	0	10	10	15	10	15	15	14
4. Capacity to perform.	15	5	10	15	12	13	10	10	15	12	12	15	10	15	13	14
5. Location and knowledge of locality of the project.	15	10	5	10	11	10	10	15	10	11	12	15	15	15	13	15
6. Demonstrated ability to facilitate public outreach.	10	5	10	5	10	8	5	10	10	10	8	8	10	7	10	9
total points	100	75	75	80	89	82	65	70	77	83	84	93	75	97	90	94
		401					379					449				

1st Choice
 2nd Choice
 3rd Choice




BEAUFORT COUNTY STORMWATER UTILITY
120 Shanklin Road
Beaufort, South Carolina 29906
Voice (843) 255-2805 Facsimile (843) 255-9478



MEMORANDUM

TO: County Council
Natural Resources Committee

FROM: Eric W. Larson, Stormwater Manager 

SUBJECT: Academy Park Subdivision and Rock Springs Creek watershed Regional Stormwater Facility project

DATE: January 4, 2016

September 30, 2015, the Planning Department's Staff Review Team gave approval to a proposed subdivision, Academy Park. The project consists of a first phase of 25 lots fronting existing roads in the Lady's Island Preservation District. A group of neighborhood property owners appealed the decision of staff to the Planning Commission citing issues such as density and traffic. On December 7, 2015, the Planning Commission upheld the staff determination that the development was allowed by the current Community Development Code. The Developer's remaining tract has the potential of adding another 10-12 homes via an internal street network. The remainder of the site has another potential use, which is the focus of this proposal.

As part of the stormwater review for this first phase, it was noted the unique location of the site adjacent to a natural wetlands and a man-made ditch conveyance serving Sam's Point Road. County Stormwater staff and the Developer began discussing the opportunity to construct a regional stormwater facility that could serve his site in addition to the greater Rock Springs Creek sub-watershed. A project in this watershed was identified in the 2006 Beaufort County Stormwater Management Plan and further defined in the 2011 Retrofit Study with a cost of approximately \$1.7 million. In December 2016, the County completed a Feasibility Study to test the effectiveness of a stormwater basin in this location and the results were favorable.

The County and Developer are proposing a partnership in which the cost of design and construction is shared and the ownership is transferred to the County at the completion of the project. This mutually beneficial project provides stormwater needs for both parties at a significantly lower cost than if done separately. Attached to this memo is a draft agreement between the County and the Developer outlining the partnership in greater detail.

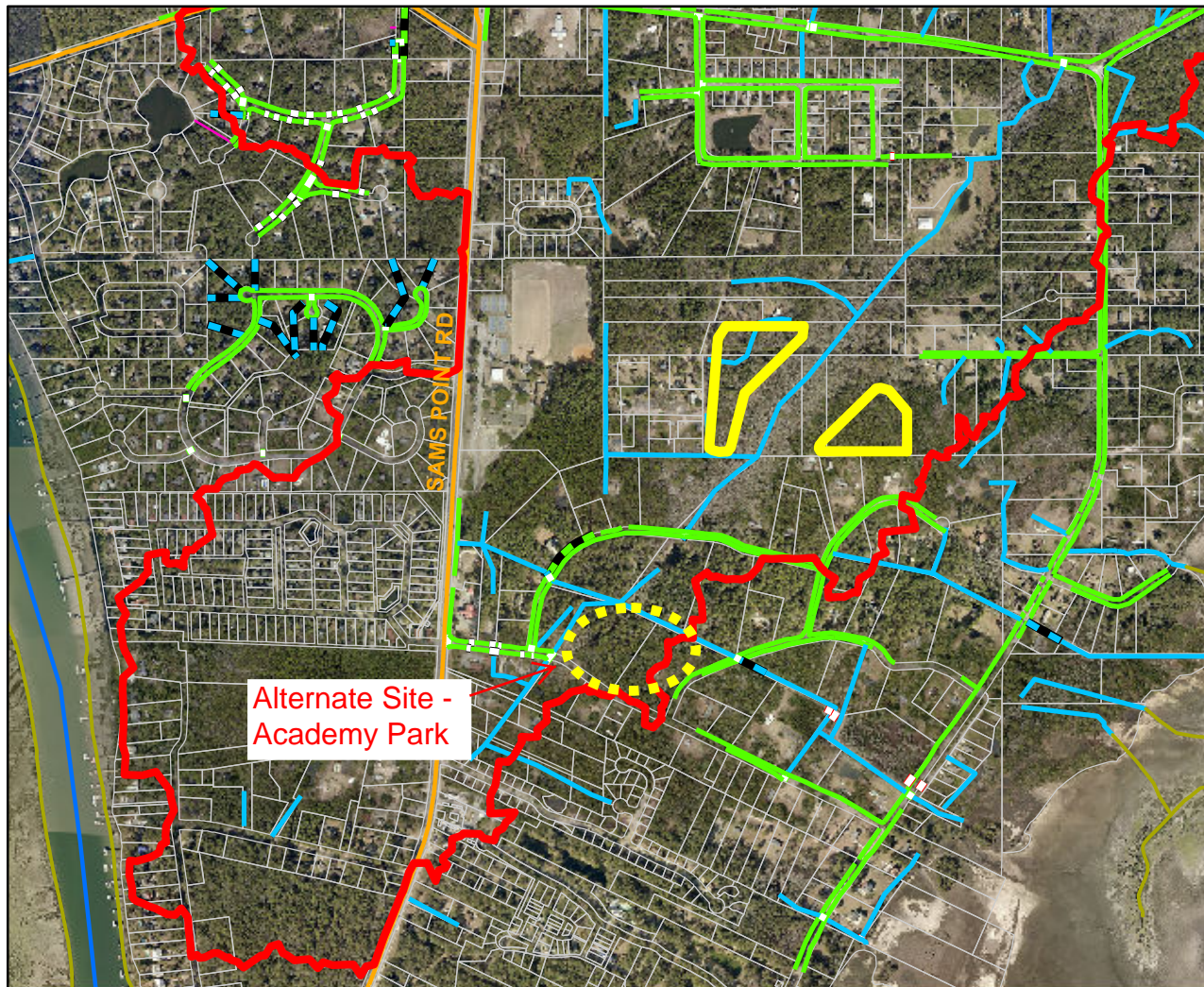
Estimated cost to the County is \$60,911. This project will be funded from the Stormwater Capital Projects fund. While this project was slated for 2018, the Stormwater Utility Board recommended re-prioritizing this project due to the potential cost saving associated with this partnership.

Staff is recommending to the County Council to authorize County Administrator Gary Kubic to negotiate and sign an agreement with Academy Park LLC for a partnership to construct a regional stormwater facility in the Rock Springs Creek watershed.

County Retrofit Project: Factory Creek M2
Activity: Regional BMP
Township: Lady's Island

Project Schedule: FY 2018, 2020 & 2022

Project Cost: \$1,740,000
\$200,000 (2018)
\$340,000 (2020)
\$1,200,000 (2022)



Drainage

TYPE	
River	Roadside
Creek/Stream	Roadside Pipe
River/Creek/Marsh BANK	Road Pipe
Channel (fka Outfall)	Crossline Pipe
Channel Pipe	Driveway Pipe
Lateral	Access Pipe
Lateral Pipe	Bleeder Pipe



0 450 900 1,800 2,700 3,600 Feet

1 inch = 1,207 feet

Prepared By: BC Stormwater Management Utility
Date Print: 5/19/14

Description: Development in the Factory Creek hydrologic sub-basin in the Rock Springs Creek watershed includes approx. 300 acres of a mix of single family development, and commercial/institutional development built prior to stormwater regulations. There are only a few stormwater best management practices, such as detention basins, in the area. The project would be to construct a regional detention facility to provide stormwater runoff water quality treatment and volume reduction. Due to the grades of the area and the "stop gap measure" to construct a ditch to drain a portion of the wetland, construction will involve a large amount of earthwork, making project cost a limiting factor for project implementation. Rock Springs Creek drains into the Morgan River, which is impaired by bacteria pollution, a major source being urban runoff. The site is located in Beaufort County on Lady's Island.



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Technical Memorandum

To: Eric Larson, P.E.

From: Tony Maglione, Robert Burleson, P.E.

Date: December 14, 2015

Re: Factory Creek Watershed Stormwater Pond Feasibility Study: Samples Property

Introduction:

The County is evaluating a developer's offer to provide a site for an approximately 3.4 acre stormwater retention pond in the watershed. In the CDM/Smith SW Management Plan of 2006 Factory Creek was designated as a watershed that would require a 16% reduction in fecal coliform levels at build out. A subsequent study by Ward Edwards Engineering identified two locations in the watershed that would be possible locations for stormwater ponds. However, the Ward Edwards identified sites are in the lower two thirds of the watershed where the developer proposed site is in the top third of the watershed.

An initial review of the aerial photography and existing stormwater infrastructure near the developers site, may provide additional opportunities to intercept and treat stormwater from existing drainage systems and potentially use the pond for removal of other pollutants of concern in addition to fecal coliform; such an option does not appear to exist at the sites identified in the Ward Edwards study.

Beaufort County has asked Applied Technology and Management (ATM) to evaluate the feasibility of using the developer's proposed site in lieu of the two locations shown in the Ward Edwards study.

Site Description

The Samples site is located in the Factory Creek M2 hydrologic sub-basin, which is a portion of the Rock Springs Creek 2 Water Quality Basin. The site is located on Lady's Island as shown on Figure 1. It is located just north of Fairfield Drive and approximately 1,200 ft. east of Sam's Point Road. The site and the proposed stormwater pond location is presented on Figure 2. Topography across the proposed pond site ranges from 16 ft-NAVD.

on the west side near the County drainage easement to 18 ft-NAVD on the east side.
Slopes are relatively flat with some isolated depressions.

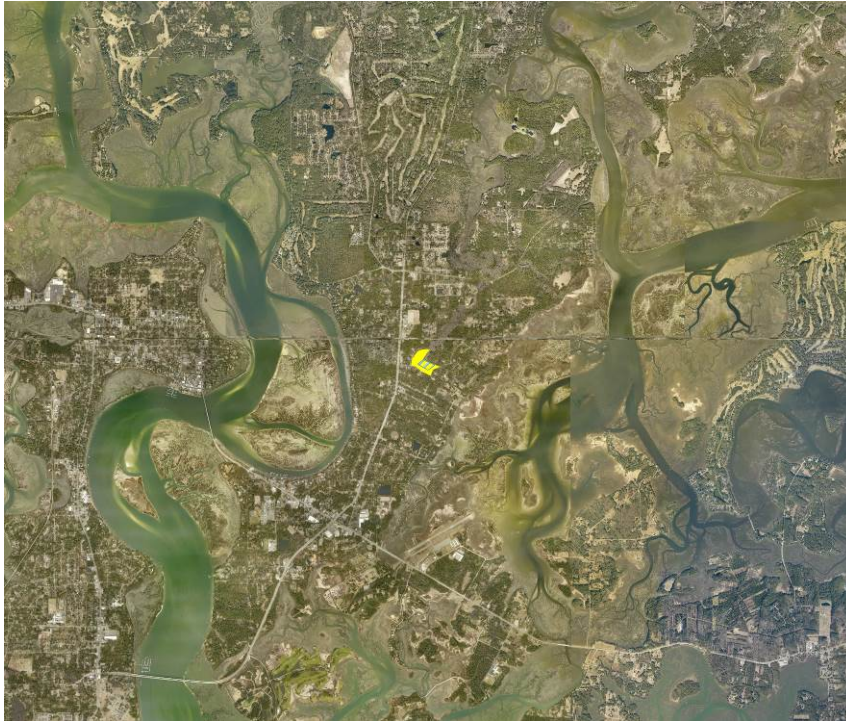


Figure 1: Location of Samples Property



Figure 2: Samples Property

The proposed stormwater pond site is bounded on the north by a regional drainage ditch that conveys runoff from Sam's Point Road east directly to the Morgan River. The ditch has effectively cut off flow coming from the south and would only overflow to the north if water elevations in the ditch exceeded 13.3 ft-NAVD, per topographic information received from Carolina Engineering. Ditch bottom elevations in this area range from 11.5 ft-NAVD to 11.8 ft-NAVD and average 11.6 ft-NAVD. Per the wetland delineation provided by Carolina Engineering, there are no jurisdictional wetlands on the proposed pond site. The proposed pond site is bordered on the west by 1.175 acres of delineated jurisdictional wetlands.

Contributing Basin

The drainage basin served by the drainage ditch was estimated in the 2011 Ward Edwards Study to be approximately 185 acres. This was based the northern basin boundary being drawn just north of the drainage ditch and intersecting the Factory Creek M2 basin as contained in the 2006 Beaufort County Stormwater Master Plan and the Beaufort County GIS layer.

Information contained in the Beaufort County GIS was reviewed to confirm areas that drain to the regional drainage ditch and subsequently to the proposed pond location. Information obtained and reviewed included LiDAR, drainage, water collection points and outfalls. The engineering plans for the SC Route 802 (Sam's Point Road) improvements were obtained and reviewed to confirm drainage collection areas on the highway that conveyed flow to the drainage ditch. Review of the information indicated that some areas west of Sam's Point Road did not drain to the roads collection system. Areas south of Wallace Road and the New Point development actually drain to the west (Personal Communication, J. Ackerman, P.E., Carolina Engineering). Some smaller areas east of Sam's Point Road also do not drain to the road drainage system. Excluding these areas resulted in a smaller drainage basin to the potential stormwater pond site. The resultant drainage basin is approximately 132 acres and is presented on Figure 3.

The drainage basin associated with the proposed pond location includes a mixture of property uses including low density residential, medium density residential, commercial, and institutional. The majority are low density residential that pre-dates any stormwater control regulations. The institutional land use (Beaufort Academy) also pre-dates current stormwater regulations and does not appear to have a detention pond.



Figure 3: Contributing Basin and Proposed Pond Location

Wet Detention Pond Concept for the Samples Property

Allowing for buffers, sloping to existing surrounding grades and access roads for future maintenance, the actual pond size is estimated to be 3.4 acres. Ditch bottom elevations in this area range from 11.5 ft-NAVD to 11.8 ft-NAVD and average 11.6 ft-NAVD. The regional drainage ditch overflows to the north if water elevations in the ditch exceeded 13.3 ft-NAVD, per topographic information received from Carolina Engineering. Elevations on the proposed pond site range from 16 ft-NAVD to 18-ft NAVD. Given the elevations in the drainage ditch, the operational active storage will be between 11.8 ft-NAVD, the control elevation of the pond and 13 ft-NAVD, the overflow elevation. Recommended mean depths

for the permanent pool are 3-7 ft. below the pond control elevation. This range would place the pond bottom at an average elevation of 4.8 ft-NAVD. to 8.8 ft-NAVD.

The concept is to create an offline wet detention pond. A diversion channel would be constructed from the existing regional drainage ditch to the excavated pond. The concept includes a weir in the drainage ditch at a crest elevation of 13 ft-NAVD. Flows in the drainage ditch would be diverted into the pond until the diversion weir was overtopped at elevation 13 ft-NAVD. Major flows would still be allowed to overflow the drainage ditch to the north as occurs now. A bleed-down orifice would be constructed with a control elevation at 11.8 ft-NAVD. The discharge from the bleed-down orifice would be east, or downstream, of the diversion weir.

Recommended permanent pool volumes for wet detention systems are to provide at least a 14-day hydraulic residence time (HRT) for desired removal efficiencies to be achieved. The Watershed Management Model (WMM) was used to estimate flows and pollutant loads from which HRT and pollutant loads removed could be estimated. The WMM files were provided to the County by CDM/Smith and were the same files used in the development of the 2006 Beaufort County Stormwater Management Plan. These files were provided to ATM for use in the feasibility assessment of the Samples property.

A new WMM scenario was developed for the Samples Property and its contributing basin using the base WMM databases as provided by CDM/Smith. Land cover estimates were made using 2015 aerial photographs. The results of the WMM analysis are presented in Table 1. The WMM simulation indicates an annual mean daily flow of 0.556 acre-feet/day. For July, which is typically the wettest month of the year with 7.4 inches of precipitation, this would yield a monthly mean daily flow of 1.001 acre-feet/day. To achieve the recommended 14-day HRT for July, assuming a pond area of approximately 3.3 acres at the pond control elevation of 11.8 ft-NAVD would require a mean depth of approximately 4.25-ft. with a resultant pond-bottom elevation of 7.55 ft-NAVD. **Estimated excavation quantity assuming an average land surface elevation of 17 ft-NAVD is 52,000 cubic yards.**

Table 1 also presents estimated pollutant loads from the contributing 132-acre basin. The receiving water quality parameter of focus is fecal coliform. **Based on 80% reduction of fecal coliform loads from the contributing basin in the proposed wet detention pond, this would result in an overall fecal coliform load reduction in the Rock Springs Creek 2 water quality basin (1,188 acres) of approximately 5.6%. Based on the**

removal efficiencies in WMM, the proposed pond is anticipated to also provide the following pollutant load reductions to the Morgan River:

<u>Parameter</u>	<u>lbs/yr removed</u>
Total Nitrogen	273
Total Phosphorus	71
TSS	29,288

In summary, the construction of a regional BMP at the Samples property provides a number of benefits over the proposed BMP site for the Factory Creek M2 basin. The location of the property adjacent to the regional drainage ditch allows for capturing and treating runoff from a 132-acre basin which has a very limited amount of water quality BMPs. It is located in an area that should not present difficulties for environmental permitting given the avoidance of jurisdictional wetlands and that the regional drainage ditch allows for the placement of needed ancillary structures without direct wetland impacts. Any potential dewatering impacts to vicinity wetlands are avoided as the operational range of water levels for the proposed pond can be consistent with those of the existing regional drainage ditch.

The original Factory Creek M2 regional BMP proposed in the 2006 Beaufort County Stormwater Management Plan was evaluated previously by Ward Edwards in 2011. The conclusion was that constructing the ponds would require significant excavation in some locations, but is not completely unfeasible. There should be sufficient room to grade the top banks back to existing elevations, although it will reduce the pond sizes somewhat. Access to the western pond could easily be provided from Milton Way, as the road fronts about 500 lf of the road. However, access to the eastern pond would be difficult if not impossible, as it is bordered by wetlands on the west and north sides, and by residential lots on the east and south sides. Access would either require wetland impacts or easements crossing the home sites. Field wetland approximations would be needed if this BMP location is pursued, and wetland impact permits would be needed to intercept and redirect flow from the main conveyance channel. The cost of this alternative was estimated to be \$1,700,000.

The most important limitation to consider in evaluating the original BMP location is the potential service area. Following review of available GIS information, the SCDOT engineering plans for SC Route 802, and discussions with local engineers, the location is only capable of serving an area of less than 100 acres. Given the likely challenges to implementing the original proposed BMP and the reduced benefit from that originally estimated in the 2006 report, locating a regional BMP in that location is not considered desirable.

Table 1: WMM Results for Samples Regional Facility Scenario

<u>Tributary Area (acres)</u>	<u>DCIA (acres)</u>	<u>DCIA (%)</u>	<u>Loading Factor</u>	<u>Parameter</u>	<u>Units</u>	<u>Storm Water</u>	<u>Base Flow</u>	<u>Point Source</u>	<u>CSO</u>	<u>Total</u>	<u>Storm Water with BMP Controls</u>	<u>CSOs with Controls</u>	<u>Total with Controls</u>	<u>Reduction (%)</u>
132	23	17.1		Flow	(ac-ft/yr)	126	77	0	0	203	126	0	203	0
132	23	17.1	medium	FC Geomean Log	lbs/yr	1,266	482	0	0	1,747	1,063	0	1,545	11.6
132	23	17.1	medium	F-Coli	counts/yr	4.70E+13	1.90E+11	0	0	4.71E+13	9.43E+12	0	9.62E+12	79.6
132	23	17.1	medium	Pb	lbs/yr	6	0.209378635	0	0	6	1	0	1	77.1
132	23	17.1	medium	Total N	lbs/yr	683	209	0	0	893	410	0	620	30.6
132	23	17.1	medium	TP	lbs/yr	117	34	0	0	151	47	0	80	46.6
132	23	17.1	medium	TSS	lbs/yr	36,646	3,769	0	0	40,415	7,358	0	11,127	72.5
132	23	17.1	medium	Zn	lbs/yr	27	0.209378635	0	0	27	13	0	14	49.6
132	23	17.1	medium	BOD	lbs/yr	3,361	628	0	0	3,989	2,018	0	2,646	33.7

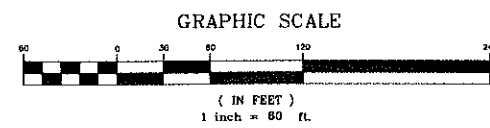
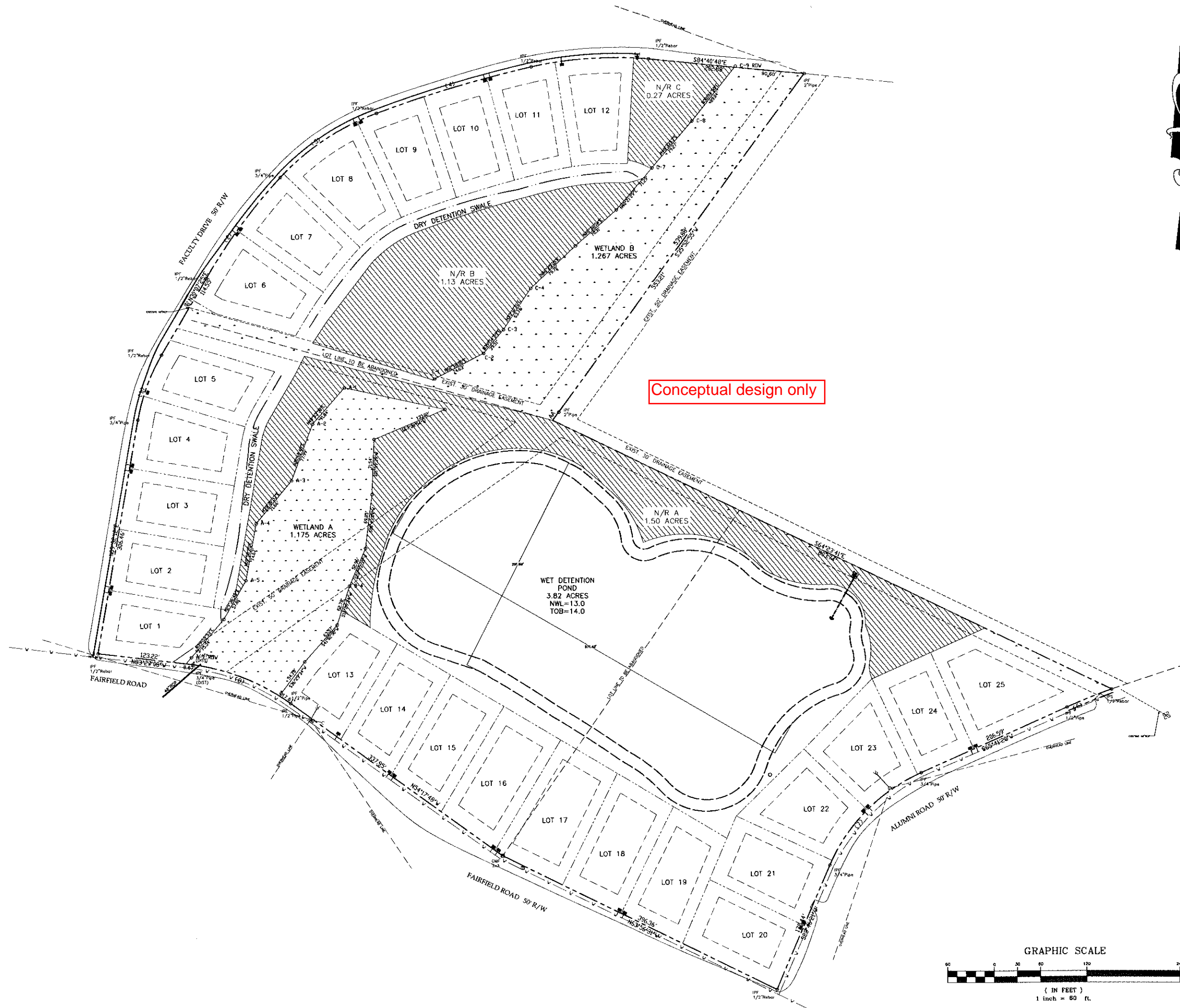
Summary

The construction of a regional BMP at the Samples property provides a number of benefits over the proposed BMP site for the Factory Creek M2 basin including:

1. The location of the property adjacent to the regional drainage ditch allows for capturing and treating runoff from a 132-acre basin which has a very limited amount of water quality BMPs.
2. It is located in an area that should not present difficulties for environmental permitting given the avoidance of jurisdictional wetlands and that the regional drainage ditch allows for the placement of needed ancillary structures without direct wetland impacts.
3. Any potential dewatering impacts to vicinity wetlands are avoided as the operational range of water levels for the proposed pond can be consistent with those of the existing regional drainage ditch.
4. The water quality benefits to Morgan River can be provided at a reduced capital cost due to developer-provided services

The original Factory Creek M2 regional BMP proposed in the 2006 Beaufort County Stormwater Management Plan has a reduced potential service area that is likely smaller than that of the Samples property site. Access to this site is more limited. There is uncertainty as to how much "useable" area is available for building the BMP given that field wetland delineations have not been performed and wetland impact permits would be needed to intercept and redirect flow from the main conveyance channel into the ponds. Also, there are greater capital costs related to land acquisition and construction.

Recommendation: Based on the analysis performed, it is recommended that Beaufort County pursue implementation of a regional water quality BMP (wet detention pond) on the Samples Property.



SEAL

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ENGINEERING
CONSULTANTS
INC.
No. 00234

REGISTERED PROFESSIONAL ENGINEER

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OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING,
OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM,
WITHOUT THE WRITTEN CONSENT OF THE ENGINEER.

PLAN REVISIONS	
NO.	DESCRIPTION
1	
2	
3	
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7	
8	

ACADEMY PARK SUBDIVISION
FAIRFIELD ROAD
BEAUFORT COUNTY, SC

CAROLINA ENGINEERING CONSULTANTS, INC.
PO BOX 294
BEAUFORT, SC 29901
WWW.CAROLINAENGINEERING.COM
843/322-0553
843/322-0556 (FAX)

PROJECT:	1796
DATE:	08/20/15
REVISED:	08/20/15
DRAWN BY:	FLB
ENGINEER:	JPA
SCALE:	1"=60'

NATURAL RESOURCE
PROTECTION
EXHIBIT

1

STATE OF SOUTH CAROLINA)

ACADEMY PARK SITE
ROCK SPRINGS CREEK WATERSHED PROJECT

COUNTY OF BEAUFORT)

THIS AGREEMENT is made and entered into this _____ day of _____, 2016, by and between Academy Park, LLC, (hereinafter the “Developer”) and the County of Beaufort, South Carolina, a body politic and political subdivision of the State of South Carolina (hereinafter the “County.”)

WHEREAS, the County desires to work with Developer to potentially develop a regional best management practice (stormwater retention pond) on Developer’s property identified as the Rock Springs Creek Watershed Project (Factory Creek M2) or “Project”; and

WHEREAS, the County has previously conducted extensive studies and evaluations to develop the Stormwater 2006 Management Plan; and

WHEREAS, the 2006 Stormwater Management Plan identifies certain projects including this Project, which was further evaluated in the 2011 Regional Retrofit study; and

WHEREAS, the County is conducting a Feasibility study to evaluate the Project for the Academy Park Site (“Site”); and

WHEREAS, if the feasibility study yields favorable results, this agreement will define a Public – Private Partnership (“P3”) and serve as a contract with the Developer for the Project that includes the design, permitting, construction, and transfer of ownership of the Site. The project will need to be approved by the Stormwater Management Utility Board, Beaufort County’s Natural Resources Committee, and County Council; and

NOW, THEREFORE, for and in consideration of the foregoing recitals and the performance of the mutual promises, conditions, and covenants herein set forth, and for the other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged by the County and the Developer, the County and the Developer hereby agree as follows:

1. The Developer will be allowed to begin construction of an approximate 3.4 acre pond that does not encroach on the wetland or regional ditch leading from Sam's Point Road. It is understood that this is being allowed in anticipation of the regional basin project. Since a water body of this size is not permitted by zoning without a demonstrated stormwater need, the Developer will be required to bond the cost to restore the site to natural forest and a 1 acre pond. Should the project not get approved for construction, permitted by the County, USACE, OCRM, etc., or if the Developer fails to perform; the bond will be used to restore the site. The Developer will be allowed to retain a 1 acre maximum pond. The 1 acre pond must be approved by County Zoning.

2. The Developer shall provide bonding for approximately 3.4 acres of pond/land restoration.
3. The County shall complete a Feasibility study of the Project. (Estimated cost \$10,000)
4. The County will present the results of the Feasibility Study to the Stormwater Management Utility Board for recommendation to move forward with the Project.
5. The Developer shall purchase the Site to be developed.
6. A consultant will prepare a final design of an approximately 3.4 acre regional stormwater basin and consult with local government, OCRM, USACE, DHEC to assure design can be permitted. Consultant will be selected from the existing ID/IQ contract or pre-approved list. A Non-Competition Agreement may be needed due to existing relationship with the developer for the Academy Park proposed development
7. The County shall provide the fees for all designs needed to complete this project. (Estimated cost \$15,000)
8. The County will present the Project to the Stormwater Management Utility Board, the Natural Resources Committee, and County Council for recommendation. A public meeting may be part of this process.
9. If the Stormwater Management Utility Board, the Natural Resources Committee, and County Council approve the project, then this agreement will proceed to construction. If not, this agreement terminates without further action.
10. The County will submit the recommended and approved regional design project to the local government for permitting, and approval.
11. The Developer shall provide all permitting fees.
12. The Developer shall provide all review fees.
13. The County shall provide for half of the tree mitigation (estimated at \$71,820), or \$35,910.
14. The Developer shall provide for half to the tree mitigation (estimated at \$71,820), or \$35,910.
15. Once all the permitting requirements are complete, construction on the modification of the pond into a regional stormwater facility will be completed.
16. The Developer shall provide for all the construction costs of the Project.
17. The County shall purchase land for the sum of One Dollar and Zero Cents (\$1.00) from the Developer.
18. The County will own and operate the Project in perpetuity. The County shall provide for the perpetual Operations and Maintenance costs of the Regional Stormwater Facility.

The parties hereto affirmatively represent that this Agreement is solely for the benefit of the parties hereto and not for the benefit of any third party who is not a signature party hereto. No party, other than the signature parties, shall have any enforceable rights hereunder or have any enforcement hereof for any claim for damages as a result of any alleged breach hereof.

This Agreement shall be governed by the laws of South Carolina with venue in the County of Beaufort.

IN WITNESS WHEREOF, the parties have set their hands this day and year indicated above.

WITNESSES:

BEAUFORT COUNTY, a political sub-
division of the State of South Carolina

By: _____
Name: Gary Kubic
Title: County Administrator
Address: P.O. Drawer 1228
Beaufort, SC 29901-1228
Phone: (843) 255-2026
Fax: (843) 255-9403
Date: _____

WITNESSES:

Academy Park, LLC

By: _____
Name: Robert Samples
Title: _____
Phone: (843) _____
Fax: _____
Date: _____

Sea Level Rise Adaptation Report Beaufort County, South Carolina



Executive Summary

March 2015

S.C. Sea Grant Consortium Product # SCSGC-T-15-02



Social and Environmental
Research Institute



Acknowledgements

This report is the collaborative effort of stakeholders in Beaufort County, South Carolina, and a project team consisting of the Beaufort County Planning Department, South Carolina Sea Grant Consortium, Social and Environmental Research Institute, North Carolina Sea Grant, and Carolinas Integrated Sciences and Assessments program at the University of South Carolina. The project team assembled a Beaufort County Stakeholder Group, which met five times from August 2013 to November 2014. This group of local decision makers learned about sea level rise and the impacts to Beaufort County and discussed possible actions to increase the County's resiliency. The group drew heavily upon the local knowledge and experience of its members, and also reached out to colleagues and engaged a larger audience in two public workshops. The project team drafted this report with frequent consultation with the Stakeholder Group.

This project was sponsored by the S.C. Sea Grant Consortium pursuant to the National Oceanic and Atmospheric Administration's [National Sea Grant Office Community Climate Change Adaptation Initiative](#) Award No. NA10OAR4170073, Amendment 10. Because consultation with the Stakeholder Group began as formal academic research, the study's methodology was reviewed and approved by the [College of Charleston's](#) Institutional Review Board.¹ The Board requires that the identities of research subjects remain confidential unless waived. In later stages of the project, the majority of the Stakeholder Group chose to identify their affiliated organization to lend their support to the importance of this project.

The project team would like to thank the Beaufort County Stakeholder Group for their time, enthusiasm, and dedication to seeing this project through to completion. The project team would also like to thank all of the stakeholders who participated in interviews or workshops and provided their local knowledge and opinions to develop opportunities for Beaufort County to become more resilient to future sea level rise impacts.

Affiliations of Beaufort County Stakeholder Group Members

Beaufort County Council	Beaufort County Department of Public Works
Beaufort County Planning Department	Beaufort County Stormwater Utility
Beaufort County School District	Beaufort Group, LLC
Beaufort Soil & Water Conservation District	Coastal Conservation League
Gullah/Geechee Sea Island Coalition	National Stormwater Center
Town of Bluffton	

Project Team

[Beaufort County Planning Department](#)
[South Carolina Sea Grant Consortium](#)
[Social and Environmental Research Institute](#)
[North Carolina Sea Grant](#)
[Carolinas Integrated Sciences and Assessments](#)



¹ College of Charleston. 2014. "Office of Research & Grants Administration." http://orga.cofc.edu/pub/compliance_irb_index.shtml



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Introduction

Beaufort County, South Carolina, is a low-lying coastal county with a high sensitivity to tidal flooding and storm surge. Just over half of Beaufort County is open water, sounds, marshes, and estuaries and two thirds of its dry land is located within a flood zone. Given these vulnerabilities, community leaders pressed for the inclusion of sea level rise as an issue to consider in the [2010 Beaufort County Comprehensive Plan](#). The Plan calls for the County government to anticipate and plan for sea level rise impacts.

In response, the Beaufort County Planning Department joined with the project team to investigate opportunities for the County to adapt, or increase its capacity to adapt, to future sea level rise impacts. Adaptation is the process of adjusting one's activities to a changing environment to take advantage of benefits and reduce negative effects. Adaptive capacity is the ability of a community to make those adjustments.

The project team assembled a Beaufort County Stakeholder Group, consisting of local decision makers and stakeholders, which met five times in 2013-2014 and was frequently consulted during the development of this final report. The group drew heavily upon the local knowledge and technical experience of its members, and also reached out to colleagues and engaged a larger audience in two public workshops.

This executive summary highlights the three major sections of the full report: Beaufort County's vulnerability to sea level rise and coastal flooding, stakeholder-generated adaptation actions to respond, and a final section that briefly reviews how community input was gathered. The summary puts the data front and center, whereas the full report includes far more detail, especially regarding community commentary on adaptation actions and additional information about helpful tools or actions being taken in other communities.

With this report, Beaufort County has begun the process of preparing for sea level rise. As a next step, the Beaufort County Stakeholder Group recommends these adaptation actions be considered by the Beaufort County Regional Implementation Committees and the Beaufort County Council Natural Resources Committee.



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Beaufort County's Vulnerability

Local sea level has risen 6 inches since 1965, according to long-term data available at Fort Pulaski, GA, [tide gauge](#) on the Savannah River. As a result, Beaufort County experiences tidal flooding more frequently than in past decades (Figure 1). While most of these floods are minor nuisances today, the threat of major flooding is likely to increase rapidly with faster rates of sea level rise (Figure 2).

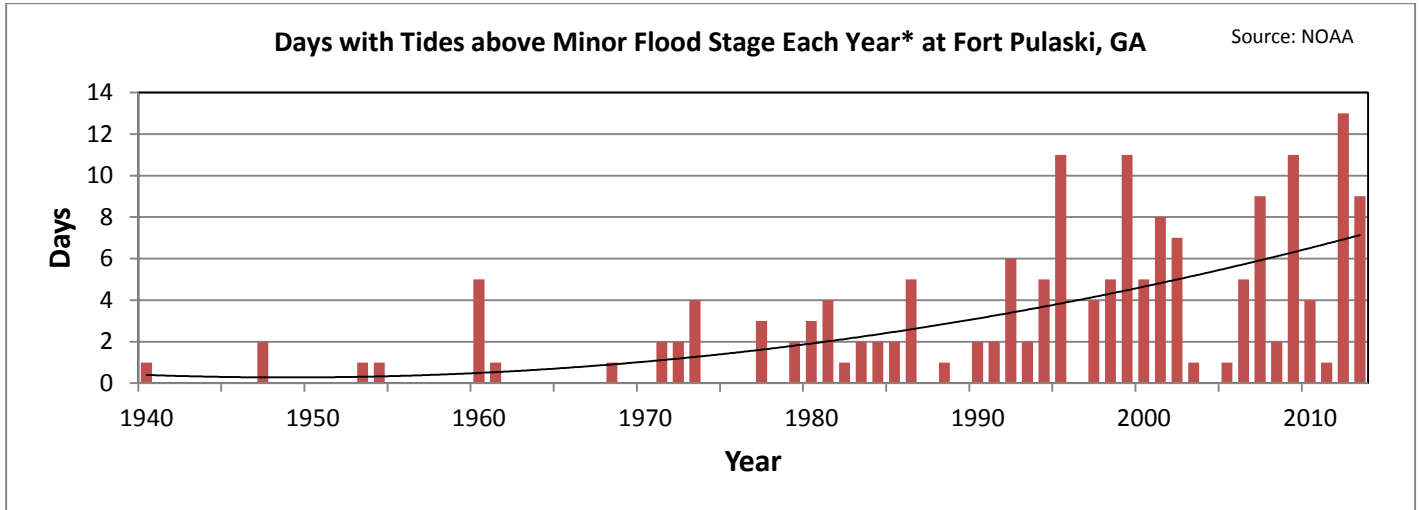


Figure 1: Extreme tides have become more common in recent decades according to tide gauge data at [NOAA Station 8670870](#) Fort Pulaski, GA. The graph displays the number of days each year when tide levels exceeded the National Weather Service [minor flood stage](#), defined as 1.7 ft. above the mean higher high tide (MHHW). The upward trend is likely due to relative sea level rise in the area (6 in. between 1965-2015). *We use the meteorological year from May 1 to April 30 so we do not split the winter storm season.

Scientists are confident that sea level will continue to rise, but they are uncertain about the pace. They expect local sea levels to rise another 3-7 inches by 2040.

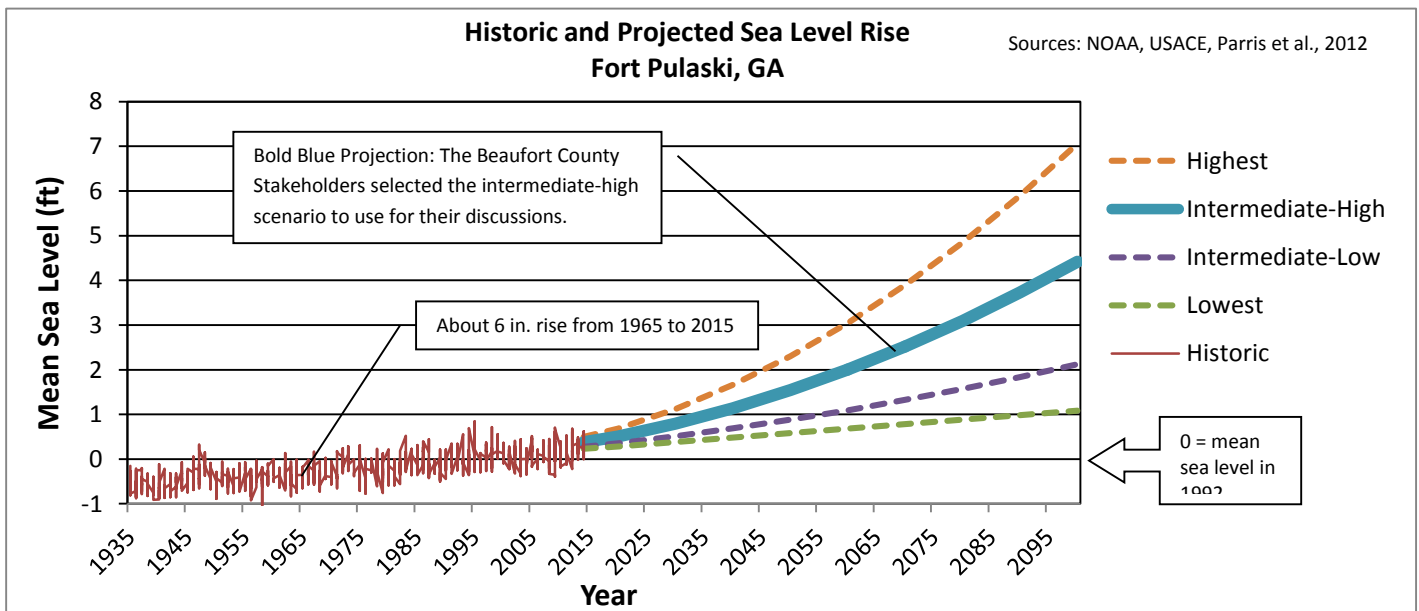


Figure 2: [Historic data](#) from the Fort Pulaski, GA, tide gauge are displayed with future [global sea level scenarios](#) provided by the U.S. National Climate Assessment and modified to incorporate the gradual sinking of the land surface in the region (land subsidence).



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Tidal Flood Map of Beaufort County, South Carolina

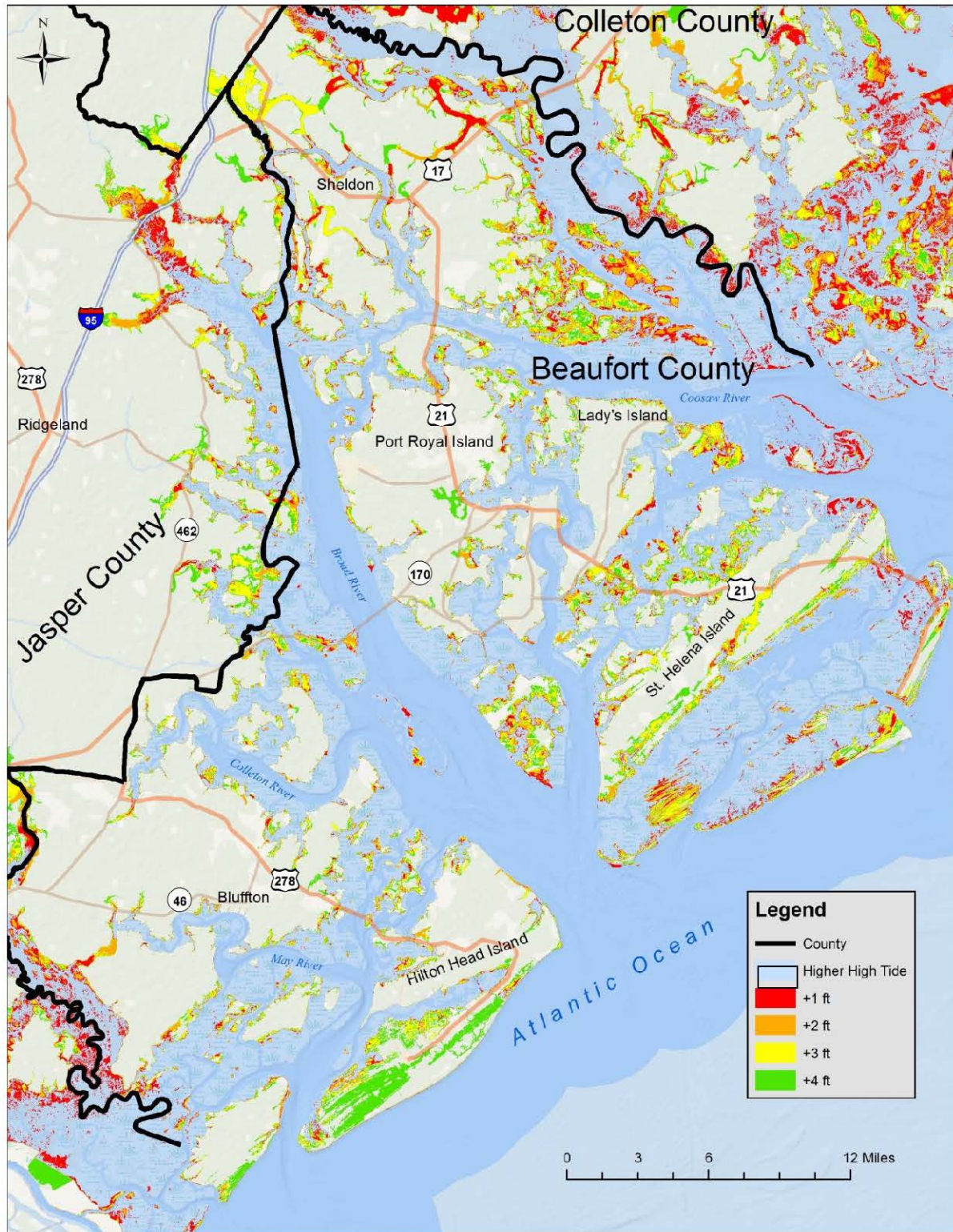


Figure 3: This flood map indicates where tidal flooding will likely occur at designated water levels above the current Mean Higher High Water mark, or the average higher high tide. Future average high tides could extend into the +1 ft. zone by 2040 and the +2 ft. zone by 2065 according to the National Climate Assessment's Intermediate-High [sea level rise scenario](#). Semi-regular [extreme tides](#) already approach the +2 ft. zone. Future extreme tides could extend into the +3 ft. zone by 2040 and the +4 ft. zone by 2065.

Sources: [NOAA](#); [Esri](#)®.



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cisa
carolinas integrated sciences & assessments

An Example of Impact: Mossy Oaks Flooding on August 10, 2014



Credit: F. White



Credit: F. White

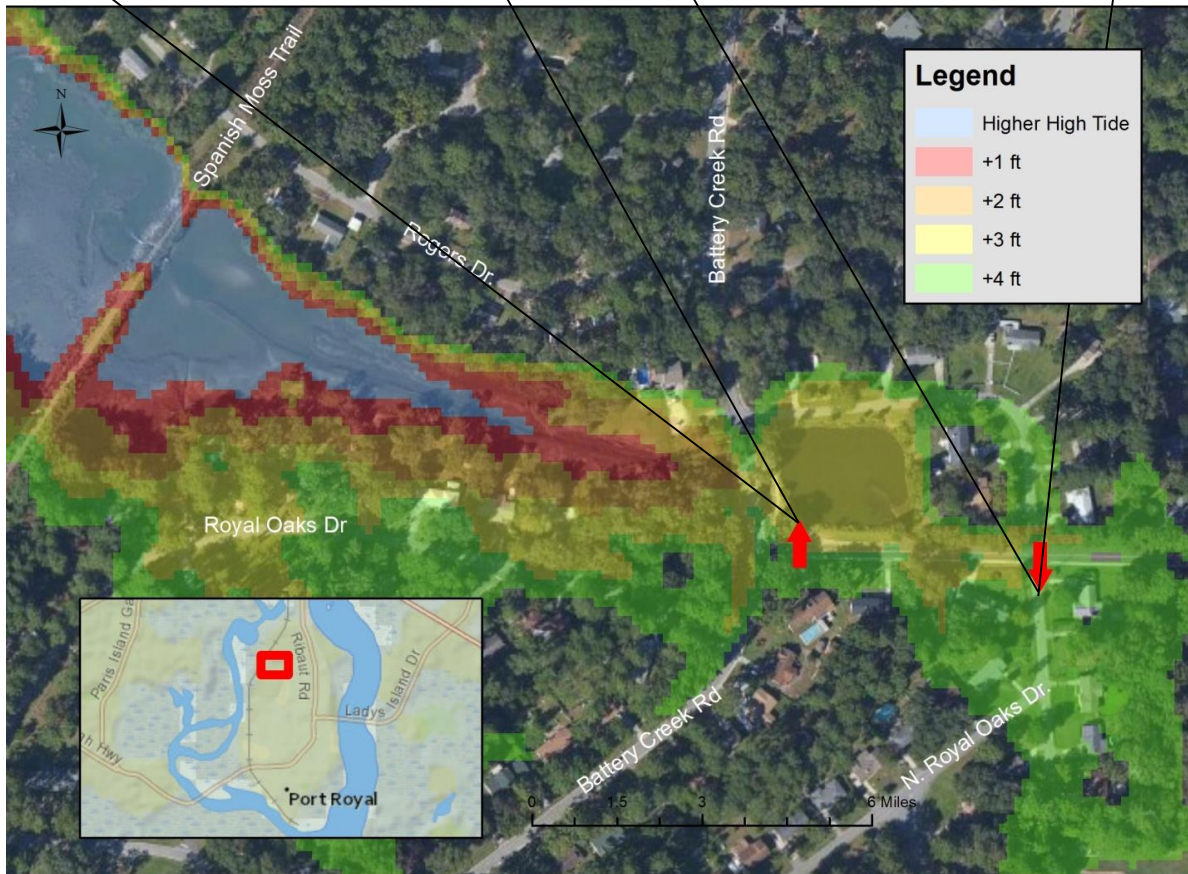
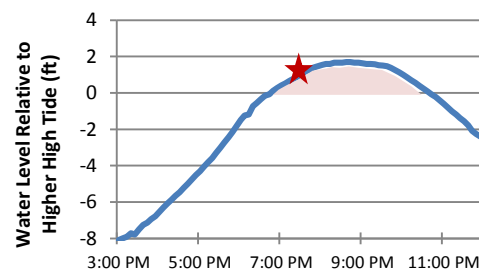


Figure 4: A real life example of tidal flooding occurred in the Beaufort neighborhood of Mossy Oaks on August 10, 2014. Heavy rains and exceptionally high tides combined to generate flooding in the +3-4 ft. zones. The photos above were taken at 7:30 p.m. (see red star in tide gauge data to the right), when the tide was about 1.5 ft. above the higher high tide line. The shaded area to the right identifies when the nearby water level exceeded the average higher high tide, which indicates potential flooding.

**Tide Gauge: Fort Pulaski, GA
August 10, 2014**



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Sea Level Rise Adaptation Action List

The following actions were identified by local stakeholders to help Beaufort County prepare for sea level rise.












	<p>1) Coordination, Cooperation, & Collaboration</p> <p><i>1.1: Improve coordination among governments and agencies.</i></p> <p><i>1.2: Facilitate a dialogue on how to balance public and private interests/responsibilities.</i></p>
	<p>2) Education & Information</p> <p><i>2.1: Develop and implement a public education campaign.</i></p> <p><i>2.2: Provide disclosure and disclaimer notice to purchasers of high risk properties.</i></p>
	<p>3) Emergency Management</p> <p><i>3.1: Incorporate future sea level rise impacts into emergency management plans.</i></p>
	<p>4) Land Management</p> <p><i>4.1: Maintain and strengthen setback policies.</i></p> <p><i>4.2: Install and encourage the use of living shorelines.</i></p> <p><i>4.3: Limit development in high risk areas.</i></p> <p><i>4.4: Use conservation to respond to sea level rise.</i></p> <p><i>4.5: Revise building codes to higher standards and incentivize better design.</i></p> <p><i>4.6: Preserve and restore ecosystems and species.</i></p> <p><i>4.7: Establish funding structures and/or tax districts to help property owners.</i></p> <p><i>4.8: Develop affordable housing in safer areas.</i></p> <p><i>4.9: Create a transfer of development rights program for low elevation properties.</i></p> <p><i>4.10: Assist with beach renourishment.</i></p>
	<p>5) Research & Monitoring</p> <p><i>5.1: Identify or establish environmental monitoring programs in the area.</i></p> <p><i>5.2: Identify trigger points for changing policy.</i></p>
	<p>6) Social Adaptation</p> <p><i>6.1: Address the impacts on disadvantaged social groups, values, and symbolic places.</i></p>
	<p>7) Transportation Adaptation</p> <p><i>7.1: Prioritize, elevate, and protect low-lying roads and causeways.</i></p>
	<p>8) Water Management</p> <p><i>8.1: Use low impact development practices.</i></p> <p><i>8.2: Build water control structures.</i></p>
	<p>9) Miscellaneous</p> <p><i>9.1: Support climate change mitigation programs.</i></p> <p><i>9.2: Increase the County's Community Rating System score.</i></p>

The Community's Top Priorities

During the public workshop, participants were given three dots to individually rank their first, second, and third priorities on the table. In this tabulation of participant voting, each action item was given a weighted score depending upon its rank, as displayed below:

Participant Rank	Weighted Score
1	3
2	2
3	1

Items that did not receive priority votes were not necessarily unimportant to the participants. These adaptation actions encompass a broad range of near- and long-term strategies, and in general some of these longer-term strategies did not receive as many votes.













Overall Rank	Adaptation Action	Category	Weighted Score
1	Identify or establish environmental monitoring programs in the area.	 Research & Monitoring	60
2	Develop and implement a public education campaign.	 Education & Outreach	44
3	Prioritize, elevate, and protect low-lying roads and causeways.	 Transportation Adaptation	39
4	Improve coordination among governments and agencies.	 Coordination, Cooperation, & Collaboration	24
5	Maintain and strengthen setback policies.	 Land Management	22
6	Install and encourage the use of living shorelines.	 Land Management	18
7	Limit development in high risk areas.	 Land Management	16
8	Use conservation to respond to sea level rise.	 Land Management	14
9	Use low impact development practices.	 Water Management	11
10	Incorporate future sea level rise impacts into emergency management plans.	 Emergency Management	10
10	Revise building codes to higher standards and incentivize better design.	 Land Management	10

(Continued on next page.)



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Overall Rank	Adaptation Action	Category	Weighted Score
10	Identify trigger points for changing policy.	 Research & Monitoring	10
11	Facilitate a dialogue on how to balance public and private interests.	 Coordination, Cooperation, & Collaboration	8
12	Provide a disclosure and disclaimer notice to purchasers of high risk properties.	 Education & Outreach	7
12	Consider the impacts on disadvantaged social groups, values, and symbolic places.	 Social Adaptation	7
13	Preserve and restore ecosystems and species.	 Land Management	5
14	Establish funding structures and/or tax districts to help property owners.	 Land Management	4
15	Support climate change mitigation programs.	 Miscellaneous	3
16	Develop affordable housing in safer areas.	 Land Management	0*
16	Create a transfer of development rights program for low elevation properties.	 Land Management	0*
16	Assist with beach renourishment.	 Land Management	0*
16	Increase the County's Community Rating System score.	 Miscellaneous	0*
16	Build water control structures.	 Water Management	0*

*Items that did not receive priority votes were not necessarily unimportant to the public. Individuals could only vote on their top 3 priorities.



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Community Input Process

The project team relied on the input of the Beaufort County Stakeholder Group, their colleagues, and other members of the public. They sought this input in order to preserve the Beaufort County community's ownership of the results. There were three formal phases of community input: scoping interviews, stakeholder group meetings, and public workshops. The interviews and stakeholder group meetings were conducted as official academic research for the College of Charleston, a member institution of the S.C. Sea Grant Consortium. Therefore, the identities of participants must remain confidential.

Scoping Interviews (June 2013)

The first step in the project was to conduct interviews to gather background information on local environmental issues and the planning process in Beaufort County. Many of these key community members would later participate in the Beaufort County Stakeholder Group.

Stakeholder Group (August 2013 & February, May, November 2014)

In the next step, the project team invited a group of local decision makers to a meeting to discuss the consequences of and responses to sea level rise in a facilitated group discussion. The first two meetings in August 2013 were structured using the Vulnerability, Consequences, and Adaptation Planning Scenarios (VCAPS) process (see full report for more information). Later meetings were informal continuations of the discussion.

Public Workshops (August 2014)

On August 25 and 26, 2014, the S.C. Sea Grant Consortium hosted two public workshops seeking local input on the Stakeholder Group's list of adaptation actions. The open workshops were advertised publicly via e-mail, press release, paper flyer, and word of mouth during the month prior.

How the Community Input was Used

Community input was the cornerstone of this project. The scoping interviews provided the necessary context information for subsequent steps. For example, the project team learned about the extensive partnership of public and private groups involved in maintaining water quality across Beaufort County. This partnership represents a success story for environmental management and an effective local network to be accessed for climate adaptation efforts.

The Stakeholder Group, using the VCAPS process for structure, created the initial list of adaptation actions. Group members have continued to provide much needed advice throughout every stage of the project, including final edits.

The public workshops critiqued, expanded, and combined adaptation actions. Whereas membership to the Stakeholder Group was by invitation only to preserve the confidentiality of its members, the workshops offered a wider opportunity for anyone in the Beaufort County community to comment.



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Sea Level Rise Adaptation Report Beaufort County, South Carolina



March 2015

S.C. Sea Grant Consortium Product #SCSGC-T-15-02



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Acknowledgements

This report is the collaborative effort of stakeholders in Beaufort County, South Carolina, and a project team consisting of the Beaufort County Planning Department, South Carolina Sea Grant Consortium, Social and Environmental Research Institute, North Carolina Sea Grant, and Carolinas Integrated Sciences and Assessments program at the University of South Carolina. The project team assembled a Beaufort County Stakeholder Group, which met five times from August 2013 to November 2014. This group of local decision makers learned about sea level rise and the impacts to Beaufort County and discussed possible actions to increase the County's resiliency. The group drew heavily upon the local knowledge and experience of its members, and also reached out to colleagues and engaged a larger audience in two public workshops. The project team drafted this report with frequent consultation with the Stakeholder Group.

This project was sponsored by the S.C. Sea Grant Consortium pursuant to the National Oceanic and Atmospheric Administration's [National Sea Grant Office Community Climate Change Adaptation Initiative](#) Award No. NA10OAR4170073, Amendment 10. Because consultation with the Stakeholder Group began as formal academic research, the study's methodology was reviewed and approved by the [College of Charleston](#)'s Institutional Review Board.¹ The Board requires that the identities of research subjects remain confidential unless waived. In later stages of the project, the majority of the Stakeholder Group chose to identify their affiliated organization to lend support to the importance of this project.

The project team would like to thank the Beaufort County Stakeholder Group for their time, enthusiasm, and dedication to seeing this project through to completion. The project team would also like to thank all of the stakeholders who participated in interviews or workshops and provided their local knowledge and opinions to develop opportunities for Beaufort County to become more resilient to future sea level rise impacts.

Affiliations of Beaufort County Stakeholder Group Members

[Beaufort County Council](#)

[Beaufort County Planning Department](#)

[Beaufort County School District](#)

[Beaufort Soil & Water Conservation District](#)

[Gullah/Geechee Sea Island Coalition](#)

[Town of Bluffton](#)

[Beaufort County Department of Public Works](#)

[Beaufort County Stormwater Utility](#)

Beaufort Group, LLC

[Coastal Conservation League](#)

[National Stormwater Center](#)

Project Team

[Beaufort County Planning Department](#)

[South Carolina Sea Grant Consortium](#)

[Social and Environmental Research Institute](#)

[North Carolina Sea Grant](#)

[Carolinas Integrated Sciences and Assessments](#)



¹ College of Charleston. 2014. "Office of Research & Grants Administration." http://orga.cofc.edu/pub/compliance_irb_index.shtml



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Key Terms

In the context of this project on Beaufort County, South Carolina, and sea level rise, we use the following definitions of these key terms:

Sea level rise: An increase in the average relative sea level over a period long enough to average out transients such as waves, tides, and storms.

Decision makers: Any group, institution, organization, or individual who makes decisions related to sea level rise or its impacts. This includes the state, county, and municipal governments, the military, private developers, marinas, homeowners, tribal groups, and environmental groups.

Adaptation: Adjustments made by decision makers that are intended to prepare for future sea level rise in a way that takes advantage of beneficial opportunities or reduces negative effects. This includes adapting to gradual sea level rise and related extreme events such as storm surges.

Adaptive capacity: The capacity of decision makers to adapt to sea level rise. Capacity includes resources, knowledge, and skills along with the political will and leadership to marshal those resources in a productive manner.

Resilience: A measure of Beaufort County's *present ability* to adapt to sea level rise without experiencing permanent harm. This differs from adaptive capacity because the latter is the *potential* for Beaufort County to adapt.

Sensitivity: A characteristic of a person, place, or thing that describes how easily harmed it is by sea level rise. A person who owns a home near sea level is much more sensitive to sea level rise than a person who owns a home on a high hill set back from the sea.

Vulnerability: This term includes all the above and summarizes the degree to which the County, or any specific location or stakeholder in the County, is susceptible to and unable to cope with anticipated sea level rise and its associated impacts. Vulnerability is a function of sea level rise, the sensitivity of the location or party, and its adaptive capacity.



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Relevant Acronyms

FEMA:	<u>Federal Emergency Management Agency</u>
MHHW:	<u>Mean Higher High Water</u>
NOAA:	<u>National Oceanic and Atmospheric Administration</u>
NWS:	<u>National Weather Service</u>
SCDHEC:	<u>South Carolina Department of Health and Environmental Control</u>
SCDNR:	<u>South Carolina Department of Natural Resources</u>
SCDOT:	<u>South Carolina Department of Transportation</u>
USACE:	<u>United States Army Corps of Engineers</u>



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Introduction

Beaufort County, South Carolina, is a low-lying coastal county with a high sensitivity to tidal flooding and storm surge. Just over half of Beaufort County is open water, sounds, marshes, and estuaries and two thirds of its dry land is located within a flood zone. Given these vulnerabilities, community leaders called for the inclusion of sea level rise as an issue to consider in the [2010 Beaufort County Comprehensive Plan](#). The Plan calls for the County government to anticipate and plan for sea level rise impacts.

In response, the Beaufort County Planning Department joined with the South Carolina Sea Grant Consortium, the Social and Environmental Research Institute, North Carolina Sea Grant, and the Carolinas Integrated Sciences and Assessments Program at the University of South Carolina (the “project team”) to investigate opportunities for the County to adapt, or increase its capacity to adapt, to future sea level rise impacts. Adaptation is the process of adjusting one’s activities to a changing environment to take advantage of benefits and reduce negative effects. Adaptive capacity is the ability of a community to make those adjustments.

The project team assembled a Beaufort County Stakeholder Group, consisting of local decision makers and stakeholders, which met five times in 2013-2014 and was frequently consulted during the development of this final report. The group drew heavily upon the local knowledge and technical experience of its members, and also reached out to colleagues and engaged a larger audience in two public workshops.

This report cites data on local sea level rise trends and reviews the 23 adaptation actions identified by the Beaufort County Stakeholder Group and members of the broader public. These 23 actions are grouped into nine categories and presented below. The report is divided into three major sections. The first is a vulnerability assessment that examines the nature of local sea level rise in Beaufort County and maps potential flood zones across the County. Section II recounts the methodology utilized to gather information and seek community input. This section includes the results of priority voting of the adaptation actions conducted by members of the public. Section III presents the findings on each adaptation action. This final section provides a brief description of the action, displays community comments in bullet points, and shares additional information including the experience of other communities and helpful tools and methods.

With this report, Beaufort County has begun the process of preparing for sea level rise. As a next step, the Beaufort County Stakeholder Group recommends these adaptation actions be considered by the Beaufort County Regional Implementation Committees and the Beaufort County Council Natural Resources Committee.












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Sea Level Rise Adaptation Action List

The following actions identified by local stakeholders help Beaufort County prepare for sea level rise via direct adaptation of policy and by expanding the County's adaptive capacity.

	<p>1) Coordination, Cooperation, & Collaboration</p> <p><i>1.1: Improve coordination among governments and agencies.</i></p> <p><i>1.2: Facilitate a dialogue on how to balance public and private interests/responsibilities.</i></p>
	<p>2) Education & Information</p> <p><i>2.1: Develop and implement a public education campaign.</i></p> <p><i>2.2: Provide disclosure and disclaimer notice to purchasers of high risk properties.</i></p>
	<p>3) Emergency Management</p> <p><i>3.1: Incorporate future sea level rise impacts into emergency management plans.</i></p>
	<p>4) Land Management</p> <p><i>4.1: Maintain and strengthen setback policies.</i></p> <p><i>4.2: Install and encourage the use of living shorelines.</i></p> <p><i>4.3: Limit development in high risk areas.</i></p> <p><i>4.4: Use conservation to respond to sea level rise.</i></p> <p><i>4.5: Revise building codes to higher standards and incentivize better design.</i></p> <p><i>4.6: Preserve and restore ecosystems and species.</i></p> <p><i>4.7: Establish funding structures and/or tax districts to help property owners.</i></p> <p><i>4.8: Develop affordable housing in safer areas.</i></p> <p><i>4.9: Create a transfer of development rights program for low elevation properties.</i></p> <p><i>4.10: Assist with beach renourishment.</i></p>
	<p>5) Research & Monitoring</p> <p><i>5.1: Identify or establish environmental monitoring programs in the area.</i></p> <p><i>5.2: Identify trigger points for changing policy.</i></p>
	<p>6) Social Adaptation</p> <p><i>6.1: Address the impacts on disadvantaged social groups, values, and symbolic places.</i></p>
	<p>7) Transportation Adaptation</p> <p><i>7.1: Prioritize, elevate, and protect low-lying roads and causeways.</i></p>
	<p>8) Water Management</p> <p><i>8.1: Use low impact development practices.</i></p> <p><i>8.2: Build water control structures.</i></p>
	<p>9) Miscellaneous</p> <p><i>9.1: Support climate change mitigation programs.</i></p> <p><i>9.2: Increase the County's Community Rating System score.</i></p>

Section I. Beaufort County Vulnerability Assessment

With its low-lying geography, Beaufort County is particularly vulnerable to elevated water levels. This section examines historic and future sea level rise and depicts the effect of heightened water levels on normal tide cycles. This includes the presentation of a county flood map that depicts future high tides and extreme high tides with 1-2 feet of base sea level rise. Lastly, this section explores what these water levels are like on the ground by recalling an August 2014, flood event at the Mossy Oaks neighborhood of Beaufort, S.C.

Sea Level Basics

Scientists use land-based tidal gauges and satellites to measure changes in sea level. Local sea level can rise for three reasons. (1) The volume of water in the ocean increases. This is currently happening for two reasons. First, ocean water is expanding as it warms. Second, glaciers and ice sheets on land are melting, leading more water to enter the seas. (2) Sea levels can also appear to change because land rises or falls. The shoreline of the eastern U.S. is generally sinking. This is called land subsidence. To some extent this is a natural process that has to do with the type of soils along the shore, but it can also be aggravated by groundwater removal. (3) Changes to ocean currents such as the Gulf Stream can lead to more water pushing up against the East Coast.

Tidal gauges measure the relative change in sea level. It is “relative” because it does not include the movement of the land itself. Satellites measure absolute mean sea level by measuring the height of the sea from the center of the Earth. Because oceans naturally rise and fall with winds, storms, tides, and seasons, all measures of sea level need to be averaged over a long time period to arrive at a clear trend.

Beaufort County experiences a semidiurnal tide. There are two high tides and two low tides of approximately equal size every day, though one of the two high tides is slightly higher than the other and one of the two low tides is slightly lower than the other (Figure 1).

The average height of all high tides is known as Mean High Water (MHW). The average height of the higher of the two daily tides is known as **Mean Higher High Water (MHHW)**, or the higher high tide line. These averages are calculated using tide gauge observations during a 19-year period known as the [National Tidal Datum Epoch](#). The current epoch is 1983-2001.

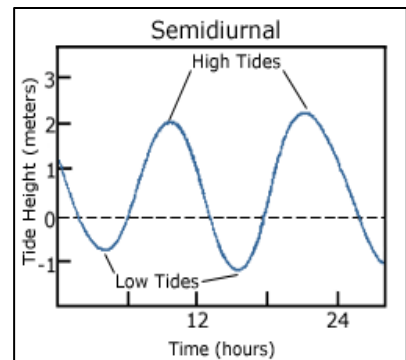


Figure 1: Semidiurnal tides consist of two daily high tides and two daily low tides of approximately equal height.
Source: NOAA

Differences in coastal land type from mudflats to marshes to forest are determined by the interaction of tidal cycles and ground elevation. For example, salt water marsh grasses thrive in elevation zones where they are flooded by water for part of the day. Many plants cannot survive when exposed to excessive salt water. MHHW can be used as the approximate boundary line between wetlands vegetation like salt marsh and upland vegetation like oak trees.



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The [National Weather Service](#) (NWS) distinguishes three primary [flood stages](#): minor flooding, moderate flooding, and major flooding.² **Minor flooding** consists of minimal or no property damage, but possibly some public threat (e.g., inundation of roads). **Moderate flooding** refers to some inundation of structures and roads near water bodies. **Major flooding** refers to extensive inundation of structures and roads. The NWS designates flood stages in Beaufort County at the following local [data points](#):

- Minor Flooding: 1.7 ft. above MHHW
- Moderate Flooding: 2.1 ft. above MHHW
- Major Flooding: 2.5 ft. above MHHW

Observed Local Data

This project uses long-term tide gauge data from nearby [NOAA station 8670870](#)³ at Fort Pulaski, GA. Although sited about 10 miles outside of the Beaufort County line, this station provides the long term data necessary for identifying sea level trends. It can be used as a proxy for major trends across the County, but may differ somewhat from specific tide gauges within the County, especially if they are located on an insulated river. Since the station's establishment in 1935, relative mean sea level has risen an average of 0.12 inches per year (Figure 2). This translates to 1.2 in./decade or 1.0 ft./century.

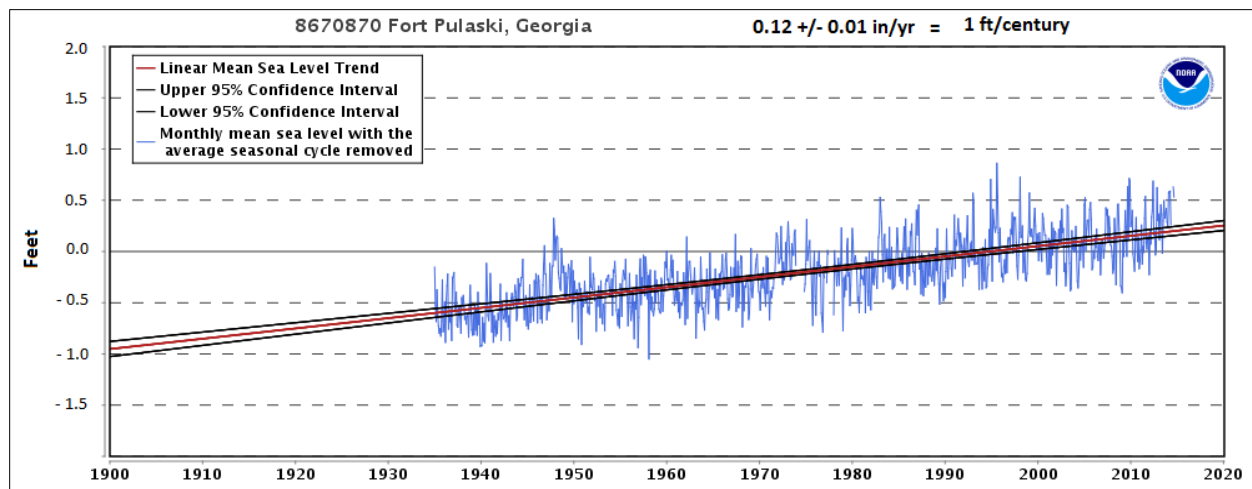


Figure 2: Mean sea level is rising at NOAA station 8670870 near Beaufort County, S.C.

² Caldwell, David B. 2012. "National Weather Service Manual 10-950, Operations and Services Hydrologic Services Program, NWSPD 10-9 Definitions and General Terminology." National Weather Service. <http://www.nws.noaa.gov/directives/sym/pd01009050curr.pdf>

³ NOAA. 2014. "Fort Pulaski, GA – Station ID: 8670870." *Tides & Currents*. <http://tidesandcurrents.noaa.gov/stationhome.html?id=8670870>

Naturally, water levels can be quite variable, fluctuating daily with tides. Figure 3 shows the highest monthly tide levels recorded at Fort Pulaski. These data are used to create annual exceedance probabilities, which quantify the water levels likely to be exceeded with 99%, 50%, 10%, and 1% probability every year. The exceedance probabilities indicate that water levels at 1-2 ft. above MHHW are common, with NWS minor flood stage and moderate flood stage occurring at least yearly and bi-yearly, respectively.

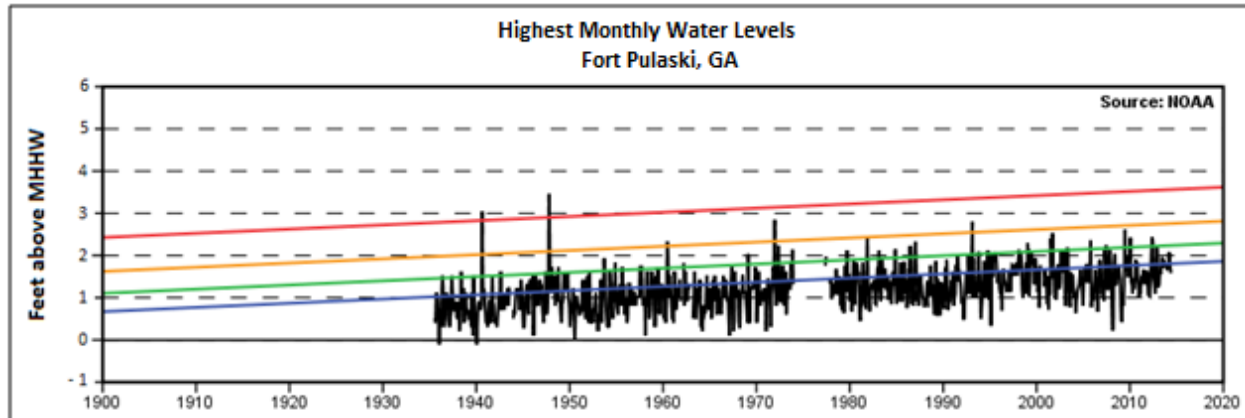


Figure 3: Data on highest monthly water levels (black line). The color lines represent the water level associated with 99% (blue), 50% (green), 10% (orange), or 1% (red) annual probability of reoccurrence, or the probability that water levels will be reached at least once during the year.

However, the annual exceedance probability levels do not measure the probability of extreme tides happening multiple times in the year. Figure 4 shows the number of days each year when tides exceeded the NWS minor flood stage. These flood events have increased over time. Although these data include tides associated with storm surge, the overall trend is due to the increased height of regular high tides.

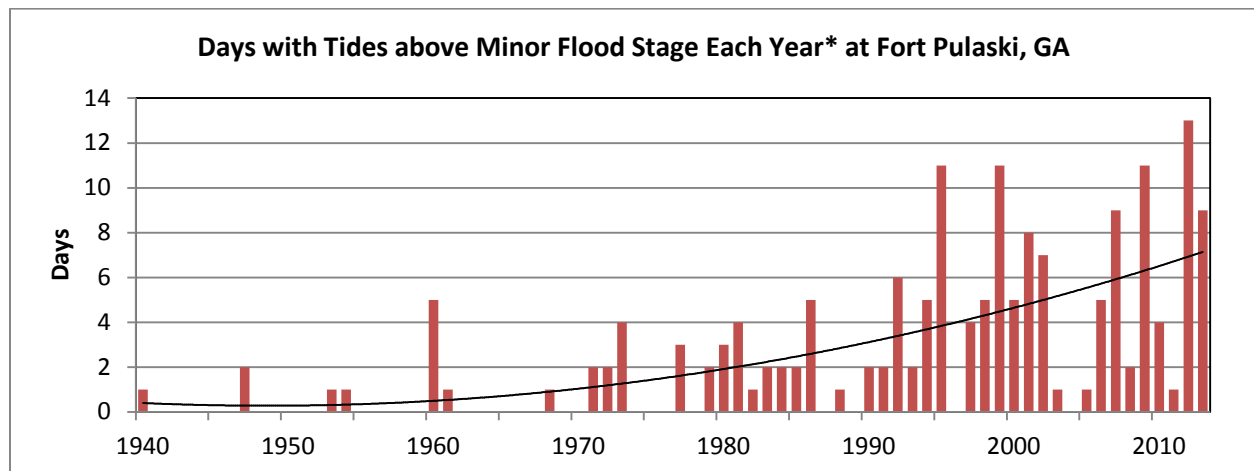


Figure 4: Extreme tides have become more common in recent decades according to tide gauge data at NOAA Station Fort Pulaski, GA. The graph displays the number of days each year when tide levels exceeded the NWS minor flood stage, defined as 1.7 ft. above the mean higher high tide (MHHW). The upward trend is likely due to the combination of sea level rise and land subsidence occurring in the area. *We use the meteorological year from May 1 to April 30 so we do not split the winter storm season.

Future Sea Levels

Global mean sea level is increasing due to thermal expansion and ice melt. Like mercury in a thermometer, water expands when heated. This increases the surface height of the ocean. Atmospheric heat melts ice, including land-based ice sheets and glaciers, adding additional water volume to ocean basins. These two forces are expected to intensify due to atmospheric heat trapped by the presence of greenhouse gases like carbon dioxide (CO₂).

The U.S. National Climate Assessment provides global sea level rise projections for four planning [scenarios](#)⁴ (Table 1; Figure 5). These scenarios are based on the full range of possibilities expressed among scientific studies. The four scenarios are guides for climate adaptation planning that communities can use to decide for themselves how precautionary they want to be. Preparing for the lowest scenario will save resources, but may leave the County vulnerable to future sea level rise risk. On the other hand, preparing for the highest scenario could protect critical infrastructure and reduce future impacts, but may prove costly and unwarranted if seas do not rise as high as anticipated in that scenario.

Table 1: Sea level rise [scenarios](#) for the U.S. National Climate Assessment.⁵

Scenarios	Description
Lowest	A scenario based on the continuation of historical trends derived from tide gauge data beginning in 1900.
Intermediate-Low	A scenario based primarily on thermal expansion, without significant ice melt.
Intermediate-High	A scenario based on thermal expansion and some ice sheet loss.
High	A scenario based on the calculation for the highest possible glacier and ice sheet loss by the end of the century.

The National Climate Assessment projections are intended for global average sea level rise. Therefore, it is important to consider local contributions to sea level rise⁶. Relative mean sea level in Beaufort County is rising more quickly than the global average due to land subsidence. Subsidence is the gradual sinking of the land surface due to natural compaction of coastal soil and/or excessive withdrawal of underground liquids like water and oil. According to the U.S. Army Corps of Engineers Sea Level Rise Curve Calculator,⁷ the rate of land subsidence at Fort Pulaski is 0.05 in./yr. It is assumed that the land surface will continue to subside at a similar rate into the future.

⁴ Parris, Adam, Peter Bromirski, Virginia Burkett, Dan Cayan, Mary Culver, and John Hall. 2012. *Global Sea Level Rise Scenarios for the United States National Climate Assessment*. National Oceanic and Atmospheric Administration (NOAA). http://cpo.noaa.gov/sites/cpo/Reports/2012/NOAA_SLR_r3.pdf.

⁵ Ibid.

⁶ The contribution of the Gulf Stream and other ocean currents are difficult to predict and are not considered in Figure 5. Ocean currents typically interact with sea level in cycles that can be averaged out over more than ~20 years.

⁷ USACE. 2014. "Sea-Level Change Calculator." *Responses to Climate Change*. <http://www.corpsclimate.us/ccaceslcurves.cfm>



Figure 5 incorporates the rate of local land subsidence into the four global sea level rise scenarios to provide localized projections up to year 2100. Scientists are 90% confident that global mean sea level will rise within the 1 ft. to 7 ft. range of these scenarios by the end of the century, but cannot attribute a probability to any specific scenario.

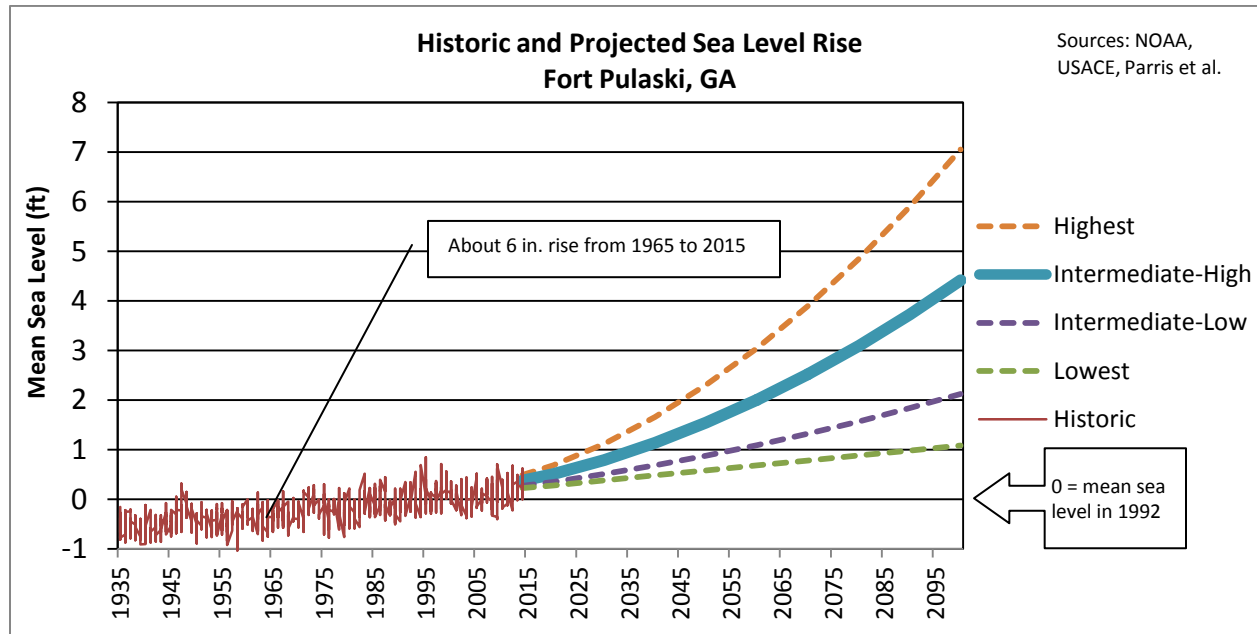


Figure 5: Historic data from the Fort Pulaski tide gauge are displayed with future global sea level scenarios provided by NOAA and modified to incorporate the gradual sinking of the land surface in the region (land subsidence). The intermediate-high scenario (bolded blue line) was selected as the planning scenario by the Beaufort County Stakeholder Group.

As mean sea level increases, tidal flooding within the year becomes more common. Figure 6 displays a projection of tidal flood events in the next six decades based on the National Climate Assessment scenarios. Even if local sea level rises at its historic rate (Lowest Scenario), the number of tidal floods will increase to an average of 40 events per year by 2060. If sea level rises at its highest projected rate, tidal flooding could occur at nearly every high tide of the year.

Flood Mapping

To determine the impact of future projections in sea level, the Beaufort County Stakeholder Group selected two data points from the intermediate-high scenario: +1 ft. sea level rise by 2040 and +2 ft. sea level rise by 2065 (Figure 5). These two points represent the length of a mortgage (about 30 years) and infrastructure design life (about 50 years) respectively, from the time this project was initiated. The project team used Esri's geographic information systems software, ArcGIS®, to map the potential impact of elevated water levels across Beaufort County (Figure 7).

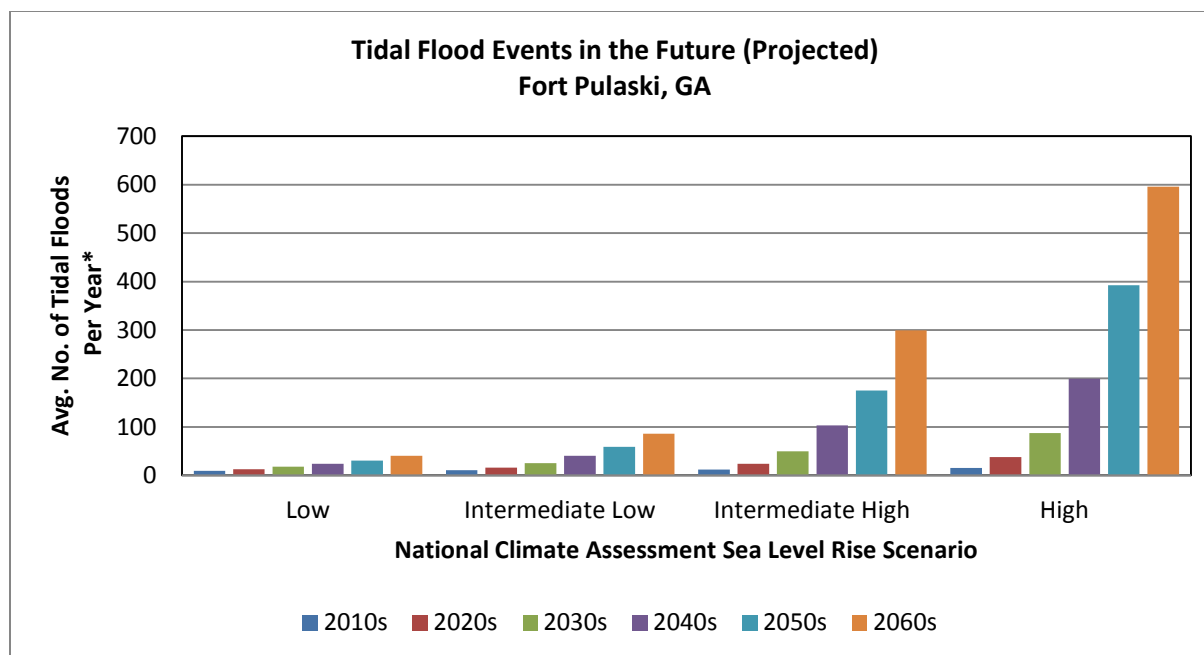


Figure 6: Flood events surpassing the NWS minor flood stage (1.7 ft. MHHW) will become more common in the coming decades. The project team created these projections using tide gauge data from the NOAA Inundation Analysis [tool](#)⁸ and [methodology](#) described by NOAA.⁹ For each analysis, we averaged the number of flood events above the flood stage [threshold](#) at NOAA [station 8670870](#) Fort Pulaski, GA, over a 10-year period from 2000 to 2010. Because these data come from a 10-year period, it does not remove the effect of multi-year or multi-decadal oscillations in sea level. In other words, the analysis assumes that tidal data will be identical to 2000-2010, but with a higher base water level. *Tidal floods possible twice daily during high tides.

The project team used one-foot sea level rise contours provided by the NOAA Office of Coastal Management’s Sea Level Rise and Coastal Flooding Impacts Viewer.¹⁰ These layers were designed using 2002 Light Detection and Ranging (LiDAR) elevation data from the Beaufort County GIS Department. The layers simulate the vertical and horizontal movement of the tidal water line onto the topography of the land surface. This methodology is sometimes known as a “bathtub model” because the water fills the basin up to the modeled land surface just like water fills a bathtub. This type of mapping does not factor in other forces that will shape Beaufort County’s shoreline as the sea rises, including wave action due to storm surge, erosion of the shoreline, changing hydrological patterns, or the protection of shoreline by humans.

The base sea level layer in the model is set at Mean Higher High Water (MHHW) in order to distinguish currently dry land from wetlands. Layers at +1 ft. and +2 ft. MHHW are used to show future higher high tides in 2040 and 2065 (Intermediate-High scenario) and +3 ft. and +4 ft. are displayed to show the impact of semi-regular extreme tides (i.e., Figure 3).

⁸ NOAA. 2015. “Inundation Analysis Tool.” *Tides & Currents*. <http://tidesandcurrents.noaa.gov/inundation/>

⁹ Pendleton. 2013. “What’s the Frequency, Kenneth? (With Coastal Flooding That Is).” *Digital Coast*. <http://coast.noaa.gov/geozone/whats-frequency-kenneth-coastal-flooding/#.VL-5Eff83d>

¹⁰ NOAA Office for Coastal Management. 2014. “Sea Level Rise and Coastal Flooding Impacts Viewer.” *Digital Coast*. <http://coast.noaa.gov/digitalcoast/tools/slr>

Tidal Flood Map of Beaufort County, South Carolina

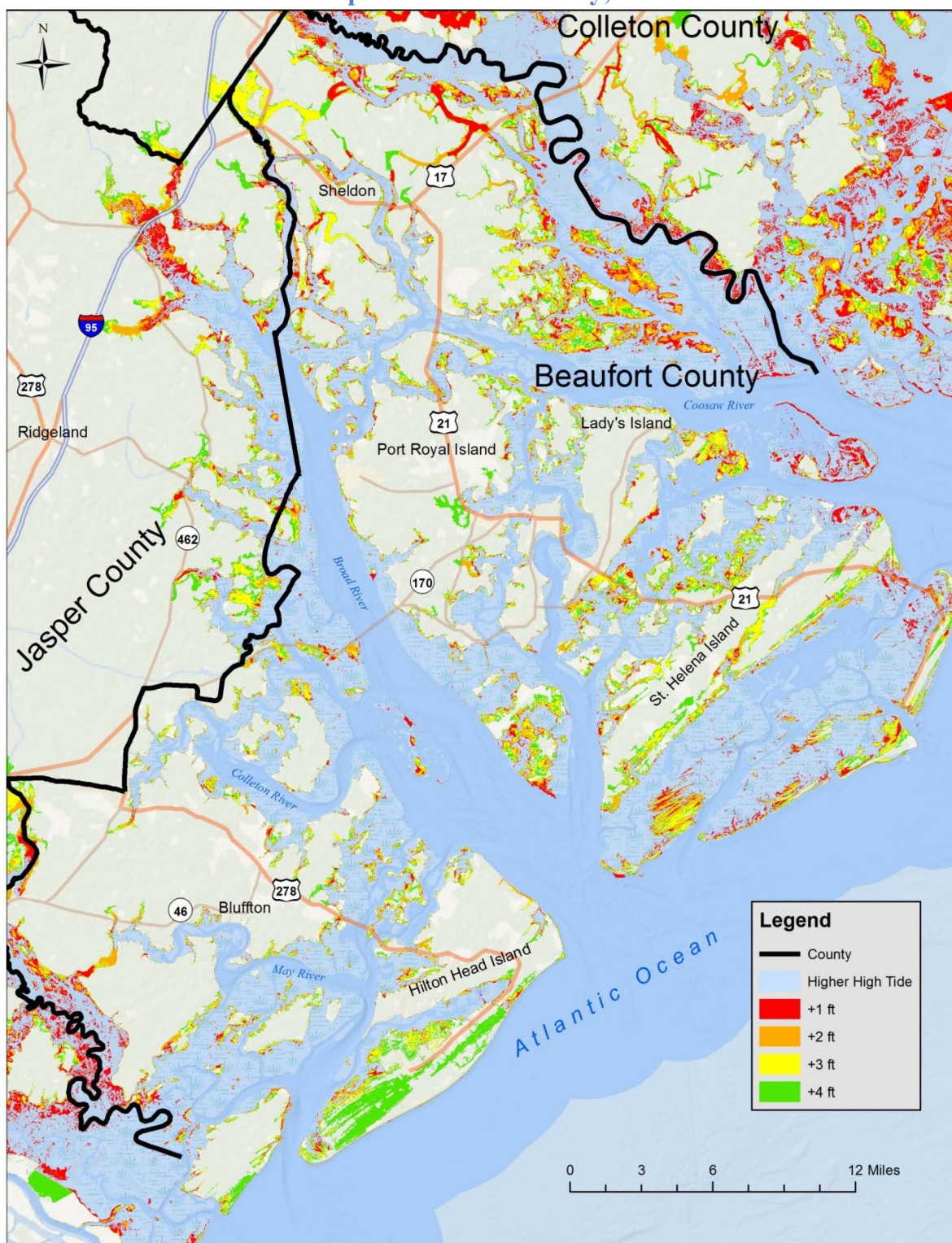


Figure 7: This flood map indicates where tidal flooding will likely occur at designated water levels above the current Mean Higher High Water mark, or the average higher high tide. Future average high tides could extend into the +1 ft. zone by 2040 and the +2 ft. zone by 2065 according to the National Climate Assessment's Intermediate-High sea level rise [scenario](#). Semi-regular extreme tides already approach the +2 ft. zone. Future extreme tides could extend into the +3 ft. zone by 2040 and the +4 ft. zone by 2065.

Sources: NOAA; Esri®.



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Figure 7 depicts the widespread impact of elevated water levels on Beaufort County, showing that sea level rise is a concern for the rural inland communities of the County just as much as the oceanfront Sea Islands. Daily high tides 1-2 ft. above current levels will first erode many of the isolated hammocks and extensive marshland of the Sea Islands. It will encroach onto the dry land adjacent to creeks and rivers.

If base sea level was 1-2 ft. higher than the current level, then semi-regular extreme high tides will be 3-4 ft. higher than current levels. As the yellow and green colors on Figure 7 indicate, these extreme tides could flood 20,000-30,000 acres of dry land. While much of the vulnerable land resides in the low-density rural regions of northern Beaufort County, up to 9,000 acres of urban and residential land uses could be flooded without protection. These tides could cause significant property damage in properties not built to current FEMA flood zone standards.

The most extreme floods today offer a glimpse into the regular tidal floods of the future. In mid-August 2014, local water level approached 2 ft. above MHHW amid several days of intense rainfall. Drainage systems in the Mossy Oaks neighborhood of Beaufort, S.C. were overwhelmed. A local resident documented extensive flooding in the 3-4 ft. above MHHW zones displayed in Figure 8. In the real world, weather and the state of development can intensify the impact of tidal flooding.

Ultimately, the flood maps like those in Figure 7 and 8 depict a bathtub model of an unchanging world. In reality, Beaufort County and its residents will gradually respond to reoccurring floods. The Beaufort County Stakeholder Group was concerned with the big picture view of encroaching sea level rise. As presented in this report, the flood map is intended to inform members of the public and introduce sea level rise as a County-wide planning issue.



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An Example of Impact: Mossy Oaks Flooding on August 10, 2014

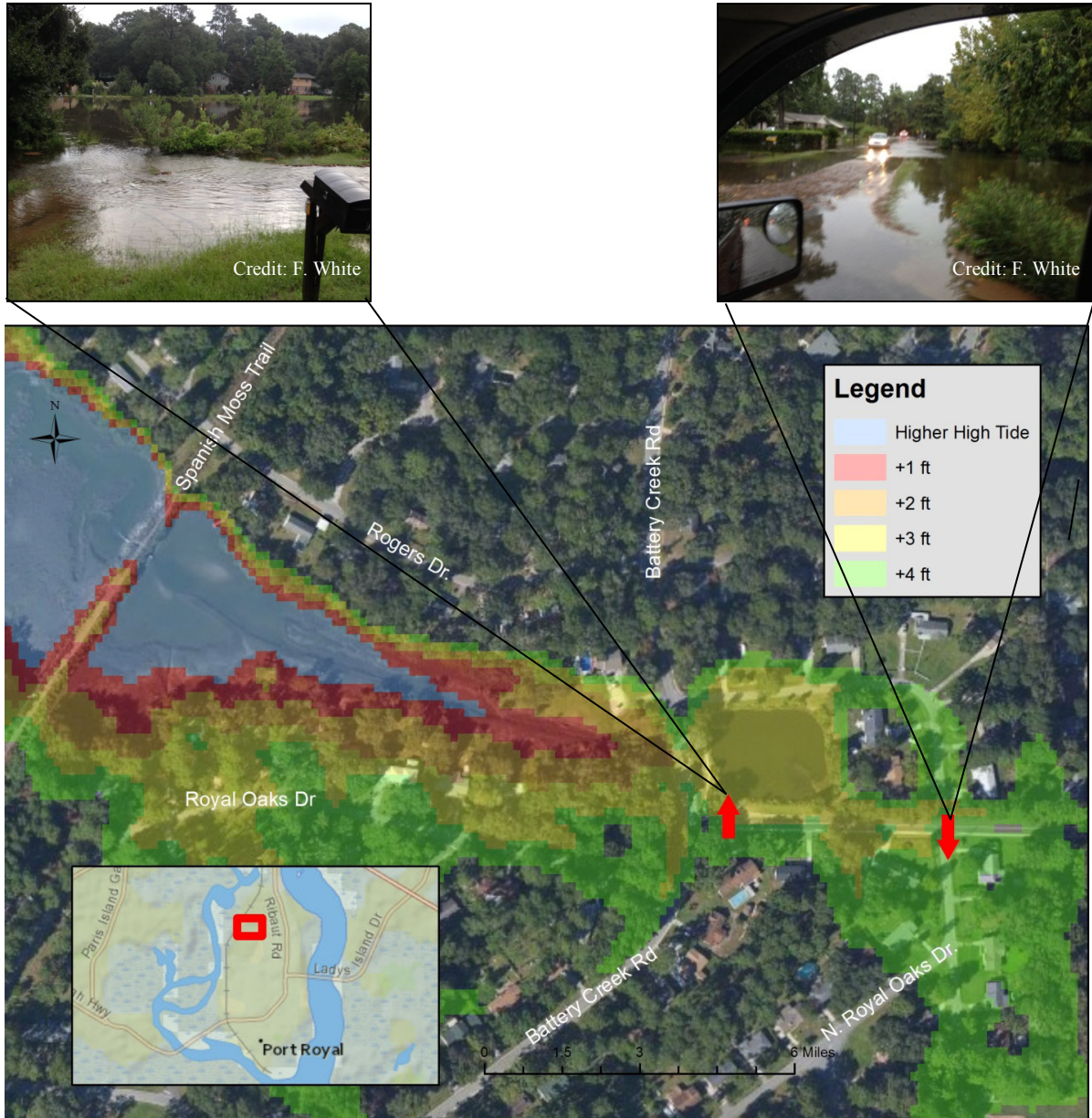
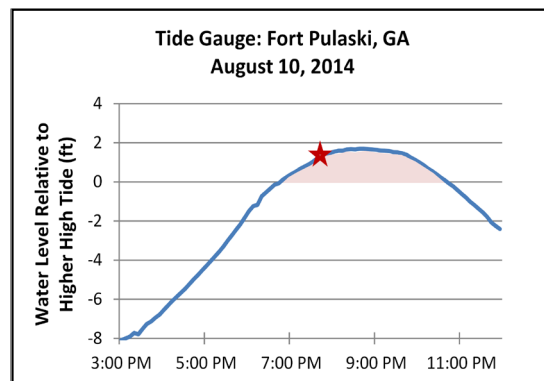


Figure 8: A real life example of tidal flooding occurred in the Beaufort neighborhood of Mossy Oaks on August 10, 2014. Heavy rains and exceptionally high tides combined to generate flooding in the +3-4 ft. zones. The photos above were taken at 7:30 p.m. (see red star in tide gauge data to the right), when the tide was about 1.5 ft. above the higher high tide line. The shaded area to the right identifies when the nearby water level exceeded the average higher high tide, which indicates potential flooding.



Section II. Community Input Process

The project team relied on the input of the Beaufort County Stakeholder Group, their colleagues, and other members of the public. They sought this input in order to preserve the Beaufort County community's ownership of the results. There were three formal phases of community input: scoping interviews, Stakeholder Group meetings, and public workshops. The interviews and Stakeholder Group meetings were conducted as official academic research for the College of Charleston, a member institution of the S.C. Sea Grant Consortium. Therefore, the identities of participants must remain confidential.

Scoping Interviews (June 2013)

The first step in the project was to conduct interviews to gather background information on local environmental issues and the planning process in Beaufort County. Many of these key community members would later participate in the Beaufort County Stakeholder Group.

Participants

Interview candidates were selected based on their community standing and the relevance of their role to planning and environmental issues in Beaufort County. An initial contact list was proposed by Beaufort County planner Robert Merchant. Candidates were contacted via phone or e-mail. Fifteen people were interviewed. In-person interviews followed rules established by the College of Charleston's Institutional Review Board for research involving human participants.¹¹

Stakeholder Group (August 2013 & February, May, November 2014)

In the next step, the project team invited a group of local decision makers to a meeting to discuss the consequences of and responses to sea level rise in a facilitated group discussion. The first two meetings in August 2013 were structured using the Vulnerability, Consequences, and Adaptation Planning Scenarios (VCAPS) process (see Process section below). Later meetings were informal continuations of the discussion contained herein.

Participants

Most of the interviewees were invited to join the Stakeholder Group. Additional community members were added to the discussion in later meetings based on the need for their expertise. For example, two private business owners and additional county staff members were consulted during the process. There were a total of 19 group members over five meetings in Beaufort County.

¹¹ College of Charleston ORGA. 2014. "Office of Research & Grants Administration." College of Charleston. http://orga.cofc.edu/pub/compliance_irb_index.shtml



Process

The group discussions were structured using the Vulnerability, Consequences, and Adaptation Planning Scenarios (VCAPS) [process](http://vcapsforplanning.org/).¹² VCAPS is an approach to decision support that integrates local knowledge with scientific understanding. It has been previously used in at least 13 coastal communities, including Sullivan’s Island and McClellanville in South Carolina.¹³

VCAPS researchers lead community decision makers through group discussion about local issues affected by environmental change. Experts are invited to provide basic context about the science and decision makers use that information to collectively identify local vulnerabilities, consequences, and adaptation actions based on the climate hazard. During these discussions, the researchers create diagrams that represent how the decision makers understand the links between climate hazards and their consequences for Beaufort County, as well as the actions that government entities and private individuals or groups can take to reduce or prevent any consequences. Figure 9 displays the concept boxes used to organize a VCAPS diagram into a logical flow beginning with the relevant management concern and ending with the consequences initiated by climate hazards.

The Stakeholder Group created two VCAPS diagrams. The first diagram displayed a discussion on the impact of development and rainfall patterns on stormwater management (Appendix A). The second diagram captures the effect of sea level rise and storm surge on planning (Appendix B).

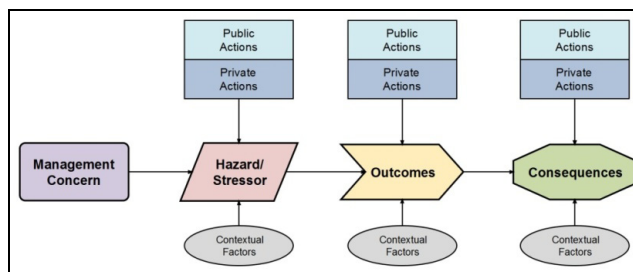


Figure 9: The legend for a Vulnerability, Consequences, and Adaptation Planning Scenarios (VCAPS) diagram shows how the focus group discussion was structured.

After initial meetings in August 2013, the Stakeholder Group reconvened in February and May 2014 to continue the discussion with the use of sea level rise flood maps created by the S.C. Sea Grant Consortium using geographic information systems (GIS) software. The maps provided a spatial focus to the group’s discussions about vulnerability.

Throughout these discussions, the Beaufort County Stakeholder Group identified many adaptation actions. Their actions were the foundation of the list contained in this report. The group met a final time in November 2014 to provide input on the draft report.

¹² SERI & CISA. 2014. “VCAPS: Vulnerability, Consequences, and Adaptation Planning Scenarios.” <http://vcapsforplanning.org/>

¹³ Webler, Thomas, Seth Tuler, Kirstin Dow, Jessica Whitehead, and Nathan Kettle. 2014. “Design and Evaluation of a Local Analytic-Deliberative Process for Climate Adaptation Planning.” [Local Environment](#). 17 July.

Public Workshops (August 2014)

On August 25 and 26, 2014, the S.C. Sea Grant Consortium hosted two public workshops seeking local input on the Stakeholder Group's list of adaptation actions. The workshops were advertised publicly via e-mail, press release, paper flyer (Appendix C), and word of mouth during the month prior.

Participants

Seventy-seven people attended the two public workshops. Figure 10 identifies the affiliation of attendees according to a post-workshop evaluation survey. The three largest groups included concerned citizens, non-profit groups, and state agency employees.

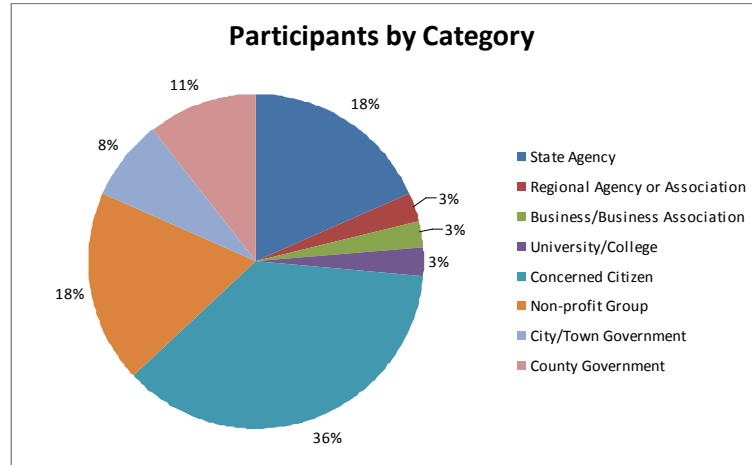


Figure 10: The affiliation of attendees to the Beaufort County Sea Level Rise Adaptation workshops according to a post-survey evaluation survey.

Workshop Format

Two public workshops were held in Beaufort County: one at the Bluffton regional library and another at the St. Helena regional library. Their formats were identical (Appendix D). The three-hour workshops were divided into two parts. The first half of the workshops was dedicated to presentations on Beaufort County's vulnerability to sea level rise and the progress of the Stakeholder Group in identifying adaptation actions. During the second half of the workshops, the project team facilitated separate breakout group discussions with 5-10 people. This structure allowed members of the public to provide their own informed commentary on potential adaptation actions for Beaufort County.

How the Community Input was Used

Community input was the cornerstone of this project. The scoping interviews provided the necessary context information for subsequent steps. For example, the project team learned about the extensive partnership of public and private groups involved in maintaining water quality across Beaufort County. This partnership represents a success story for environmental management and an effective local network to be accessed for climate adaptation efforts.

The Stakeholder Group, using the VCAPS process for structure, created the initial list of adaptation actions. Group members continued to provide much needed advice throughout every stage of the project, including final edits.

The public workshops critiqued, expanded, and combined adaptation actions. Whereas membership to the Stakeholder Group was by invitation only to preserve the confidentiality of its members, the workshops offered a wider opportunity for anyone in the Beaufort County community to comment.



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Top Priorities of Workshop Participants












During the public workshops, each participant ranked their first, second, and third priorities from among 23 adaptation actions. In this tabulation of participant voting, each participant's first, second, and third priority were awarded a weighted score as displayed below:

Participant Rank	Weighted Score
1	3
2	2
3	1

Items that did not receive priority votes were not necessarily unimportant to the participants. These adaptation actions encompass a broad range of near- and long-term strategies, and in general some of these longer-term strategies did not receive as many votes.

Overall Rank	Adaptation Action	Category	Weighted Score
1	Identify or establish environmental monitoring programs in the area.	 Research & Monitoring	60
2	Develop and implement a public education campaign.	 Education & Outreach	44
3	Prioritize, elevate, and protect low-lying roads and causeways.	 Transportation Adaptation	39
4	Improve coordination among governments and agencies.	 Coordination, Cooperation, & Collaboration	24
5	Maintain and strengthen setback policies.	 Land Management	22
6	Install and encourage the use of living shorelines.	 Land Management	18
7	Limit development in high risk areas.	 Land Management	16
8	Use conservation to respond to sea level rise.	 Land Management	14
9	Use low impact development practices.	 Water Management	11
10	Incorporate future sea level rise impacts into emergency management plans.	 Emergency Management	10
10	Revise building codes to higher standards and incentivize better design.	 Land Management	10



Overall Rank	Adaptation Action	Category	Weighted Score
10	Identify trigger points for changing policy.	 Research & Monitoring	10
11	Facilitate a dialogue on how to balance public and private interests.	 Coordination, Cooperation, & Collaboration	8
12	Provide a disclosure and disclaimer notice to purchasers of high risk properties.	 Education & Outreach	7
12	Consider the impacts on disadvantaged social groups, values, and symbolic places.	 Social Adaptation	7
13	Preserve and restore ecosystems and species.	 Land Management	5
14	Establish funding structures and/or tax districts to help property owners.	 Land Management	4
15	Support climate change mitigation programs.	 Miscellaneous	3
16	Develop affordable housing in safer areas.	 Land Management	0*
16	Create a transfer of development rights program for low elevation properties.	 Land Management	0*
16	Assist with beach renourishment.	 Land Management	0*
16	Increase the County's Community Rating System score.	 Miscellaneous	0*
16	Build water control structures.	 Water Management	0*

*Items that did not receive priority votes were not necessarily considered unimportant. Each participant voted only for their top three priorities.



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Section III. Adaptation Actions

This section provides expanded information on the 23 adaptation actions vetted by the Beaufort County Stakeholder Group and the public workshop participants. Each entry describes the action, lists participant comments, and cites relevant examples and useful resources.

More specifically, this section uses the following format:

Category #: Title

Action #: Title

Adaptation Action full sentence.

Each adaptation action listing will begin with a basic description of that action.

#.1: Community Input

The community input section is designed to summarize commentary from the interviews, Beaufort County Stakeholder Group, and the public workshops. Their commentary is structured into bullet points to increase readability. Please note: Not every adaptation action will be structured with the same bullet point categories. Participants did not always address the same issues regarding every action.

#.2: Additional Information

The additional information section includes information gathered by the project team beyond that discussed during the community input phases. This information is provided for additional context, to highlight the experiences of other communities, and to reference tools that may help Beaufort County implement the adaptation action.



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Category 1: Coordination, Cooperation, and Collaboration

Action 1.1: Inter-Governmental Cooperation

Improve coordination among governments and agencies.

The number of government agencies with jurisdiction over common coastal issues makes collaboration challenging. By encouraging communication and joint activities, the County can increase its capacity to adapt to sea level rise.

1.1.1: Community Input

Community stakeholders provided the following comments on this adaptation action:

- Concerns
 - Future of military presence
 - Government disunity across agencies
 - Security of fresh drinking water supply in Savannah River
 - Need to identify responsibilities among agencies
 - Collection and availability of state environmental monitoring data
- Suggestions
 - Learn from other communities (i.e., Miami, N.C. Outer Banks, Norfolk)
 - Create a standing working group for climate change to capture grant funds for sustained programs
 - Regional coastal adaptation network could offer economy of scale advantage
 - Leverage other sea level rise and resiliency-focused efforts in S.C.
- With partners:
 - Military
 - Municipalities
 - Regional alliances/councils/networks, including the Metropolitan Planning Organization
 - Relevant federal and state agencies (FEMA, SCDHEC, SCDNR, SCDOT)
 - Utilities and public service districts

1.1.2: Additional Information

Increased partnership will take unique forms depending on the issue and the organizations involved. Beaufort County can begin by clarifying decision making authority among different agencies and levels of government in relation to specific actions outlined in this report.

Other communities have used collaboration as a strategy to adapt to sea level rise. An example is the Southeast Florida Regional Climate Change [Compact](http://www.southeastfloridacclimatecompact.org/)¹⁴ established in 2009. This ongoing

¹⁴Southeast Florida Regional Climate Change Compact. 2014. <http://www.southeastfloridacclimatecompact.org/>

effort involves four counties, all of their municipalities, partners, and all 5.6 million residents. Members used the alliance to establish a single unified baseline greenhouse gas inventory, sea level rise projection, and vulnerability assessment process. These integrated assessments have allowed the counties to identify 110 action items grouped within seven goal areas.

Action 1.2: Public/Private Dialogue

Facilitate a dialogue on how to balance public and private interests/responsibilities.

Environmental management is complicated by tensions between public and private interests. To overcome this barrier, public and private entities can clarify each other's responsibilities. The aim of dialogue is to cooperatively design effective management actions that minimize disruption to existing interests of all entities.

1.2.1: Community Input

Community stakeholders provided the following comments on this adaptation action:

- Concerns
 - The effect of poorly-managed private infrastructure on overall environmental management
 - i.e., stormwater ponds, ditches, roadways, causeways
 - High risk properties that have lost market value
 - Limited funds to act
- Suggestions
 - Establish policy trigger points (see page 35) before engaging in dialogue
 - Understand private sector drivers and create policy that incentivizes private owners to adapt
 - Clarify areas that government will proactively support and areas private entities should support
 - Create special funding structures and/or tax districts to help property owners
 - Tax tourists for improvements they use
 - Maintain government role of disclosure and public education
- With partners:
 - Homeowners associations
 - Planned unit developments
 - Real estate agents

1.2.2: Additional Information

Internationally, [Public-Private Dialogue](#) (PPD) is a process used to craft more inclusive and sustainable development policies.¹⁵ It involves communicating proposed policy reforms to

¹⁵ The World Bank Group. 2014. "Public-Private Dialogue." *Investment Climate*.

<https://www.wbginvestmentclimate.org/advisory-services/cross-cutting-issues/public-private-dialogue/>

stakeholders and utilizing private sector participation to build more appropriate policies. Although this process is used primarily for economic development, it can provide a model for best practices in facilitating communication. The *PPD Handbook: A Toolkit for Business Environment Reformers*¹⁶ is one centralized source for guidance on PPD techniques.

Category 2: Education & Information

Action 2.1: Public Education

Develop and implement a public education campaign.

Public education or outreach campaigns involve reaching out to County residents to inform them of flood risk, the potential for environmental change, and relevant laws or policies. The objective is to increase local awareness about risk to inspire individuals and organizations to act.

2.1.1: Community Input

Community stakeholders provided the following comments on this adaptation action:

- Concerns
 - Importance of educating the public
 - Need to keep hearing from experts
 - Neighborhoods in low-lying areas
 - Resistance to climate adaptation policy
- Suggestions
 - Maintain a sustained effort
 - Use [Master Naturalist](#) style program¹⁷
 - Teach in local schools
 - Teach elected officials during planning orientation
 - Provide sea level rise information on County website
 - Inexpensive approach
 - Create community inventories of level of disaster preparedness
 - Engage in outreach to communities
- Education content
 - Changes to insurance rates
 - Risk levels
 - Current laws
 - Information with local focus

¹⁶ DFID, the World Bank Group, and OECD Development Centre. 2014. *Public Private Dialogue*. <http://www.publicprivatedialogue.org/>

¹⁷ Clemson University. 2014. "South Carolina Master Naturalist." *Clemson University*. <http://www.clemson.edu/public/naturalist/>



- Impacts to wildlife
- Education partners:
 - Homeowner Associations (HOAs) / neighborhood communities
 - Churches
 - New property owners
 - Developers
 - Elected officials
 - [Gullah/Geechee Sea Island Coalition](#)

2.1.2: Additional Information

The Beaufort County Stormwater Education and Outreach [program](#) is a model education collaborative in the Lowcountry region. The County [Stormwater Utility](#) works through partners at [Clemson Extension](#) and the [Port Royal Sound Foundation](#) to educate and inform residents of environmental concerns. These and other established educators could integrate climate information into their current activities with the help of regional climate extension specialists at the [S.C. Sea Grant Consortium](#)¹⁸ and the [Carolinas Integrated Sciences and Assessments](#) (CISA) program¹⁹ at the University of South Carolina.

Action 2.2: Hazard Disclosure and Disclaimer

Provide disclosure and disclaimer notice to purchasers of high risk properties.

A disclosure and disclaimer notice is a document provided to property owners to officially inform them of a hazard they may experience on their property and to absolve the County of liability for damages incurred due to the hazard. There are many types of disclosures. The State of South Carolina requires a disclosure of beachfront erosion and Beaufort County [requires one](#) for the homes surrounding the Marine Corps Air Station. The [2010 Beaufort County Comprehensive Plan](#) called for the County to consider this type of notice in reference to the threat of sea level rise.²⁰

2.2.1: Community Input

Community stakeholders provided the following comments on this adaptation action:

- Concerns
 - Lack of disaster preparedness
 - County responsibility to maintain public infrastructure
 - Litigation for failure to disclose risks
 - Unachievable due to political will and liabilities
 - Stigmatized properties

¹⁸ SCSGC. 2014. *South Carolina Sea Grant Consortium*. <http://www.scseagrant.org/>

¹⁹ Carbone, Greg. 2014. *Carolinas Integrated Sciences and Assessments*. <http://www.cisa.sc.edu/>

²⁰ Beaufort County. 2010. "Chapter 5: Natural Resources" in *2010 Beaufort County Comprehensive Plan*. Page 34.



- Realtor opposition
- Failure of current flood zone disclosures to discourage development
- Suggestions
 - Use disclosure as educational tool
 - Clarify public/private responsibilities in disclosure statement

2.2.2: Additional Information

A [disclosure notice](#)²¹ is currently required for properties residing within special flood hazard zones, however this brochure does not address sea level rise. Sea level rise will expand flood risk beyond the confines of current flood zones and intensify risk at the lowest elevations. These considerations can be incorporated into existing County flood awareness guides or packaged into a special disclosure addendum addressed only to those in the riskiest elevation zones.

Communities in Florida, Maryland, and Delaware have considered [disclosure statements](#) specific to sea level rise. The proposal in Delaware was rejected due to concerns about the potential impact on the real estate industry.²² This opposition suggests industry cooperation is vital for a successful disclosure notice.

Category 3: Emergency Management

Action 3.1: Updating Plans

Incorporate future sea level rise impacts into emergency management plans.

Emergency management planning often assumes the probability of extreme events will remain the same into the future. Sea level rise and other climate changes are likely to increase the probability of flooding and the intensity of hurricanes. A higher base sea level increases the height of storm surge and warmer Atlantic waters brew stronger hurricanes. Even storms that do not make landfall can influence regional wind patterns that cause elevated tides along the County's shoreline. These impacts can be considered in emergency plans to increase overall preparedness.

3.1.1: Community Input

Community stakeholders provided the following comments on this adaptation action:

- Concerns
 - Access of emergency services (EMS) during road flooding

²¹ Beaufort County. 2014. "[Citizen's Guide to Flood Awareness](#)."

<http://www.co.beaufort.sc.us/departments/Public-Safety/building-codes/documents/Flood-Brochure.pdf>

²² Montgomery, Jeff. 2013. "Climate change on the coast: Buyer-beware option considered." *Delaware Online*. Jan. 11. <http://www.delawareonline.com/article/20130111/NEWS08/301110053/Climate-change-coast-Buyer-beware-option-considered>



- Access to evacuation routes during road flooding
- Advertising of [Palmetto Breeze](#) evacuation pick-up
- Suggestions
 - Completely identify risk before updating plans
 - Create EMS contingency plan for coastal flooding
 - Provide additional support for vulnerable areas during evacuation
 - Public transportation
 - Early notification of evacuation
 - Perform storm evacuations during low tides
 - Prioritize elevating evacuation routes
 - Create neighborhood contingency plans
 - Use reserve funds for disaster relief and hazard mitigation

3.1.2: Additional Information

State governments in [New York](#)²³ and [Virginia](#)²⁴ are among those that have considered sea level rise from an emergency management perspective. These states have placed particular emphasis on ensuring that climate information remains consistent across plans and agencies. The New York committee recommends that agencies consider the increased demand for services post-disaster and the effect of sea level rise on evacuation routes. The committee calls for agencies to consider back-up measures for critical systems like drinking water and electricity, or the potential for sea level rise to spread contamination by flooding hazardous waste sites.

Category 4: Land Management

Action 4.1: Setbacks

Maintain and strengthen setback policies.

A setback line is a legal boundary used to create a corridor between development and the shoreline. New construction and reconstruction seaward of a setback line is prohibited. This physical separation can protect both built structures and the natural environment.

4.1.1: Community Input

Community stakeholders provided the following comments on this adaptation action:

- Concerns
 - Erosion of shoreline

²³ Grannis, Pete et al. 2010. "New York State Sea Level Rise Task Force Report to the Legislature."

http://www.dec.ny.gov/docs/administration_pdf/slrrdpt.pdf

²⁴ Watkins, John and Jim Redick. 2014. "Recommendations to the Secure Commonwealth Panel on the Issue of Sea Level Rise and Recurrent Flooding in Coastal Virginia." <http://www.norfolk.gov/DocumentCenter/View/17786>

- Water quality
- Setbacks from septic systems
- Limitations of setbacks
- Suggestions
 - Strengthen setback policies
 - Maintain position of setbacks on growing shorelines (do not move seaward)
 - Adopt relevant recommendations of the Blue Ribbon Committee on Shoreline Management
 - Incorporate buffers in addition to setbacks
 - Enforce setbacks without exceptions
 - Consider elevation in setback regulations
 - Focus on river/creek/wetland setbacks

4.1.2: Additional Information

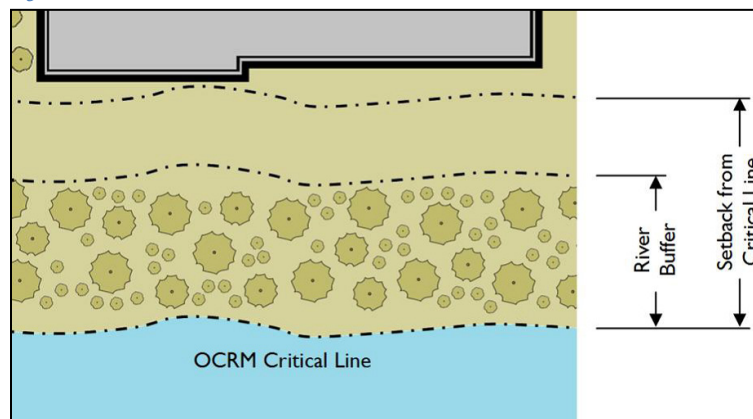


Figure 11: Vegetative buffers and construction setbacks are measured from the SCDHEC Office of Ocean and Coastal Resource Management's Critical Line, or the boundary of the shoreline.
Source: Beaufort County Planning Department

Non-beachfront setback and buffer restrictions in Beaufort County are stricter than the state standard. The County currently requires a 50 ft. natural buffer from all tidal waters, a 50 ft. setback for single-family residences, 100 ft. for townhouses, apartments, non-residential buildings, septic tanks, and tile fields, and 150 ft. for agricultural uses and golf courses. Beachfront setbacks are set by S.C. [law](#)²⁵ at 40 times the distance of the average annual erosion rate for the past 40 years from the baseline. The baseline is set at the crest of the primary sand dune. All setback lines must be established at least 20 ft. landward of the baseline, even when the shoreline has been stable or has experienced growth for the past 40 years. However, the Blue Ribbon Committee on Shoreline Management [recommended](#) that the baseline *never* be moved seaward from its position because 20 ft. is not sufficient space to allow protective dune systems

²⁵ S.C. Code § 48-39-10 et seq.

to develop.²⁶ Thus far, the S.C. General Assembly has not adopted the recommendations of the Blue Ribbon Committee, but Beaufort County can implement its own version for County beaches.

Action 4.2: Living Shorelines

Install and encourage the use of living shorelines.

Living shorelines are an approach to stabilize shorelines using a variety of natural structures and organic materials. Living shorelines involve the stabilization of ground features using plants, sand, and reefs. The root systems of plants absorb water and keep the soil in place.

4.2.1: Community Input

Community stakeholders provided the following comments on this adaptation action:

- Concerns
 - Use of hardened structures (i.e. bulkheads, revetments, sea walls)
 - Viewed by some as an easy fix to an immediate erosion problem but cause longer-term problems
 - Lack of political will to prevent use of hardened structures
- Suggestions
 - Use living shorelines as an alternative strategy
 - Restore and/or maintain natural shoreline buffers
 - Encourage private property owners to maintain buffers with native vegetation
 - Supplement existing County requirement to leave natural buffers for new developments

4.2.2: Additional Information

A common living shoreline approach in the lowcountry is the restoration of oyster reefs. Oyster reefs can protect marsh habitats and the upland behind them from erosion if the conditions are right. Oysters do best when placed in environments with low wave energy. [SCDNR](#)²⁷ and [The Nature Conservancy](#)²⁸ each manage ongoing oyster restoration projects in South Carolina.

²⁶ SCDHEC. 2013. *Blue Ribbon Committee on Shoreline Management Final Report*. S.C. Department of Health and Environmental Control (SCDHEC). <http://www.dhec.sc.gov/library/CR-010631.pdf>

²⁷ SCDNR. 2015. "South Carolina Oyster Restoration and Enhancement." *South Carolina Department of Natural Resources*. <http://score.dnr.sc.gov/>

²⁸ TNC. 2015. "Oyster Reef Restoration." *The Nature Conservancy*. <http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/southcarolina/howwework/oyster-reef-restoration-southern-solutions-for-a-global-problem-1.xml>



Action 4.3: Limit Development

Limit development in high risk areas.

Development is currently permitted in low-elevation land where tidal flooding is common and storm surge is severe. Although building codes are enforced and flood insurance is required, these waterfront properties are inherently risky. Traditional controls, like land-use zoning, could be used to limit development in such areas.

4.3.1: Community Input

Community stakeholders provided the following comments on this adaptation action:

- Concerns
 - Need for strong strategy to limit development
 - Development blocking marsh migration
 - Public liability for risky private developments
 - Government overreach in land-use regulations
 - Many areas already developed
- Suggestions
 - Use impact fees
 - Require developers to establish an escrow fund to maintain private infrastructure
 - Offer incentives to not develop
 - Prohibit sea walls along rivers and creeks
 - Encourage denser development at higher elevations

4.3.2: Additional Information

Land-use zones can be used as a tool to limit development directly. Special flood hazard zones are currently being added to comprehensive plans in Southeast Florida counties. These “adaptation action area” [overlays](#) can be defined as areas below, at, or near mean higher high water, areas with a hydrological connection to coastal waters, and areas designated as evacuation zones for storm surge²⁹ (especially below a Category 1 surge designation). The overlays establish additional, [stricter standards](#) or criteria for development and can be used as a basis for prioritization of funds just by being included in the future land-use map.³⁰

The Georgetown Climate Center wrote an extensive [legal analysis](#) of a model sea level rise overlay zone for Maryland local governments.³¹ This report cautions that local governments will

²⁹ Florida Department of Community Affairs. “Adaptation Action Area White Paper”.

<http://www.southeastfloridacclimatecompact.org/wp-content/uploads/2014/09/adap-action-areas.pdf>

³⁰ South Florida Regional Planning Council. 2013. *Adaptation Action Areas: Policy Options for Adaptive Planning For Rising Sea Levels*. <http://www.southeastfloridacclimatecompact.org/wp-content/uploads/2014/09/final-report-aaa.pdf>

³¹ Grannis et al. 2011. “A Model Sea-Level Rise Overlay Zone for Maryland Local Governments”. Georgetown Climate Center. http://www.dnr.state.md.us/ccs/pdfs/GCC_MD-SLROrdRpt_FINALv3_11-2011.pdf



need to make specific findings justifying enactment of policies in a special district to meet constitutional substantive due process requirements. Examples of justifications include risk levels, the shortcomings of existing flood plain maps to emphasize the heightened risk in future inundation areas, and the presence of rapid erosion.

Action 4.4: Conservation

Use conservation to respond to sea level rise.

Conservation and preservation programs involve the ordinary fee simple purchase or donation of development rights of a property. This prevents the property from being further developed. There are multiple motives for doing so, including the conservation of economic, natural, and cultural resources, protection of water quality in a critical area, the preservation of historic property, and the provision of open space views.

4.4.1: Community Input

Community stakeholders provided the following comments on this adaptation action:

- Concerns
 - Loss of economic, natural, and cultural resources due to development and sea level rise
 - Degradation of water quality
 - Potential abuse of land pricing
 - Expense of buying property
- Suggestions
 - Utilize Beaufort County's Rural and Critical Lands Preservation [Program](#) to target vulnerable areas that are likely to be inundated by high tides in the future
 - Analyze how this program can specifically be used to reduce sea level rise vulnerability in order to potentially justify future bond referendums that provide funding
 - Create tax incentives for limiting development rights on property while continuing historic uses

4.4.2: Additional Information

Prime conservation land is likely to shift with changing habitats and urban development patterns. Salt marsh will migrate onto former upland areas where not blocked by development. To ensure future marsh habitats through conservation, the likely pathways of marsh migration need to be identified.

It is difficult to accurately predict future habitat change, but there are some preliminary tools that can help planners. The NOAA Office for Coastal Management has a Marsh Impacts/Migration



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tab on its Sea Level Rise and Coastal Flooding Impacts [tool](#).³² This tool predicts marsh migration based on the concept that marsh grows within a specific range of elevation between land and sea.

Action 4.5: Building Codes

Revise building codes to higher standards and incentivize better design.

Building codes ensure private development is conducted in a manner that protects the public health, safety, and welfare of citizens. Building codes set minimum construction standards. They are designed to consider natural hazards like floods and hurricanes based on the probability of a particular event happening.

4.5.1: Community Input

Community stakeholders provided the following comments on this adaptation action:

- Concerns
 - Buildings in Beaufort County not adequately designed to handle gradual sea level rise and associated flooding and storm surge
 - Adequate enforcement of current building codes
 - Septic systems becoming a source of pollution
- Suggestions
 - Revise building codes to a higher standard than the [2012 International Building Codes](#)
 - Use incentives to produce better compliance with building codes
 - Update building codes in advance of a natural disaster to ensure good standards are enforced during recovery
 - Tie building code upgrades to planning thresholds: once local mean sea level records exceed the threshold, the building codes can be brought up to design standards that better reflect how the environment has changed
 - Implement stronger regulations for septic systems, including increasing setbacks from structures and shorelines
 - Consider replacing septic with sewer systems, while managing any additional development this might encourage
- Model building codes from other communities
 - [Bermuda](#): handling water runoff from houses
 - The Netherlands: building codes and other structures standards set for far worse than 1-in-100 year storm

³² NOAA Office for Coastal Management. 2014. "Sea Level Rise Viewer." *Digital Coast*. <http://coast.noaa.gov/digitalcoast/tools/slr>

4.5.2: Additional Information

The largest threat to buildings is flood damage. Beaufort County currently requires all buildings to have their lowest floor at base flood elevation, or the elevation at which there is a 1% annual probability of a flood. The current FEMA [Flood Insurance Rate Maps](#) do not incorporate calculations of future sea level rise, nor does the upcoming map update, which is scheduled for 2016. Therefore, flood risk may be higher than what base flood elevations suggest and wider than what the current special flood hazard zones suggest. A [report](#) created for the City of Annapolis, Maryland, proposed adding the projected sea level rise height in 2050 to minimum building elevations and floodproofing elevations in addition to a 2 ft. freeboard.³³ In addition to protecting structures, these regulations may also save on insurance costs by building points on FEMA's Community Rating System (see page 41).

Action 4.6: Preserve Ecosystems

Preserve and restore ecosystems and species.

Ecosystems in Beaufort County provide many services including economic value, food, flood and erosion control, wildlife biodiversity, and several [social benefits](#).³⁴ Fish and shellfish in the County provide direct food sources to local residents and visiting tourists. Marsh grasses reduce flooding on the upland and oysters protect river banks from erosion. Ecosystems in Beaufort County nurture and protect a large variety of local wildlife species, including [endangered species](#) like the shortnose sturgeon, wood stork, Florida manatee, and the pondberry.³⁵ The local environment offers many social benefits including recreation, beauty, peace and relaxation, opportunities for socialization, nostalgia, legacy value (to pass on to descendants), spiritual value, inspiration, and learning. Lastly, many people believe local ecosystems have value in and of themselves.

4.6.1: Community Input

Community stakeholders provided the following comments on this adaptation action:

- Concerns
 - Health of oyster beds with growing human presence along the coast
 - Loss of critical marsh habitat
 - Erosion due to boat traffic and oyster harvesting

³³ ERM. 2011. *Regulatory Response to Sea Level Rise and Storm Surge Inundation City of Annapolis, Maryland*. City of Annapolis. http://www.dnr.state.md.us/CoastSmart/pdfs/Annapolis_RRSLRnSSI.pdf

³⁴ NCCOS. 2014. "Social Values of Ecosystem Services in Marine Protected Areas for Management Decision-making." The NOAA National Centers for Coastal Ocean Science. <http://www.coastalscience.noaa.gov/projects/detail?key=190>

³⁵ SCDNR. 2014. "Rare, Threatened, and Endangered Species and Communities Known to Occur in Beaufort County, SC: June 11, 2014." South Carolina Department of Natural Resources. <https://www.dnr.sc.gov/species/pdf/Beaufort2014.pdf>



- Ecosystem values
 - Marshes and oyster reefs are living shorelines
 - Marsh systems act like sponges and absorb a large quantity of water during the tidal cycle
 - Oyster reefs offer habitat, filter water, and are a critical part of the food chain
- Suggestions
 - Prohibit sea walls near marshes
 - Increase restrictions on speed of boat traffic in critical waterways
 - Improve and better enforce Beaufort County's tree protection ordinance to ensure that large root systems continue to stabilize shorelines and reduce flood risks

4.6.2: Additional Information

Beaufort County's existing [efforts](#) to preserve water quality³⁶ serve a key role in protecting local ecosystems and species. Remaining priorities to protect and restore ecosystems depend on the specific impacts of sea level rise on a given habitat. This action will require a combination of research and monitoring, conservation, setbacks, and buffers.

Action 4.7: Funding Structures

Establish funding structures and/or tax districts to help property owners.

Governments can create special tax districts to help local communities pool funding for private localized infrastructure improvements.

4.7.1: Community Input

Community stakeholders provided the following comments on this adaptation action:

- Concerns
 - Development in risk-prone areas is too inexpensive and easy
- Suggestions
 - Internalize cost of siting private development in environmentally risky areas
 - Restructure development impact fees to cover costs incurred by the County for maintaining vital infrastructure vulnerable to rising seas
 - Require developers to establish an escrow fund with an allocation for each lot so the neighborhood would have the funds to directly pay for the maintenance of local roads and stormwater ponds

4.7.2: Additional Information

Impact fees used for coastal flood protection measures could be tied to particular geographic areas by using an adaptation action area overlay zone (see page 26). The risk-based overlay

³⁶ Beaufort County. 2015. "Water Quality Monitoring." <http://www.bcgov.net/departments/Engineering-and-Infrastructure/stormwater-management/water-quality-monitoring.php>



could also provide a legal justification for a targeted tax which is then earmarked for specific infrastructure improvements in the area, including elevating roads, coastal armoring, and conservation purchases. Escrow accounts can similarly be used to foster resilience to sea level rise as recommended by the workshop participants. They are regularly used to set aside funds for hazard insurance. They have also been [utilized](#) on an international scale under the [Clean Development Mechanism](#) of the [Kyoto Protocol](#) to establish a forest protection condition on investments to donor countries.³⁷ Beaufort County may be able to require large developers to create escrow funds in the planned unit developments, but this requires further legal analysis.

Action 4.8: Affordable Housing

Develop affordable housing in safer areas.

The goal of affordable housing is to ensure the availability of low price homes for lower and moderate income buyers. However, cheaper land may also be riskier land. Low income homeowners may find it more difficult to recover from severe flooding than their more affluent neighbors. One action to adapt is to incentivize affordable housing only in areas outside of current and future flood zones.

4.8.1: Community Input

Community stakeholders provided the following comments on this adaptation action:

- Concerns
 - Residents living paycheck-to-paycheck in substandard housing
 - Public investment in recurring flood areas
- Suggestions
 - Collaborate on affordable housing at regional scale
 - Coordinate assistance of low income residents through the [Human Services Alliance](#) and the [Together for Beaufort County](#) initiative

4.8.2: Additional Information

NOAA's [Coastal County Flood Exposure Snapshot](#)³⁸ reveals that 50% of the Beaufort County population living in poverty resides within a FEMA-designated special flood hazard area (7,731 individuals). County incentives, such as density bonuses, could be limited to non-flood zones to encourage safer affordable housing. However, the geography, housing market, and availability of land may become barriers to affordable housing in safer areas. For example, work force housing should be sited near major employers, not in distant rural areas.

³⁷ Schwarze, Reimund, and John O. Niles. 2001. "The Long-Term Requirement for CDM Forestry and Economic Liability." In [Law and Economics of International Climate Change Policy](#). Springer Science+Business Media Dordrecht, the Netherlands.

³⁸ NOAA Office for Coastal Management. 2015. "Coastal County Snapshots." *Digital Coast*. <http://coast.noaa.gov/digitalcoast/tools/snapshots>



Existing affordable homes within the flood plain may experience increasing pressure from flooding and rising insurance costs. Subsidized policies in the [National Flood Insurance Program](#) will be gradually adjusted to actuarial rates in the coming years. The [Center for NYC Neighborhoods](#) published a [report](#) on the effect of rising flood insurance costs on affordable homes in the New York metro area.³⁹ The report calls for guidance on alternative mitigation actions and affordable financing options to elevate homes. It may be useful to conduct further research on how Beaufort County government can protect affordable homes in vulnerable areas.

Action 4.9: Transfer of Development Rights

Create a transfer of development rights program for low elevation properties.

[Transfer of Development Rights](#) (TDR) programs issue certificates representing development rights to property owners in “sender” areas where development is undesirable. These property owners can then sell the certificates to property owners in “receiver” areas, where the certificate is redeemable with a multiplier for additional dwelling units on the property. This maintains a low density for the sender area and a higher density for the receiver area by using market forces.

4.9.1: Community Input

Community stakeholders provided the following comments on this adaptation action:

- Concerns
 - Willingness of receiver area to increase density

4.9.2: Additional Information

The Town of Bluffton implemented a [successful TDR program](#) in the May River area, but designs for a [TDR program](#) surrounding the Marine Corps Air Station have not progressed. Success of these programs is highly dependent on the characteristics of the marketplace. This tool may not work everywhere.

Action 4.10: Beach Renourishment

Assist with beach renourishment.

Sea level rise will worsen beach erosion. If erosion rates increase dramatically, there may be pressure for Beaufort County to contribute to beach renourishment along developed beaches like Hilton Head, Fripp, and Harbor Islands.

4.10.1: Community Input

Community stakeholders provided the following comments on this adaptation action:

³⁹ Center for NYC Neighborhoods. 2014. *Rising Tides, Rising Costs: Flood Insurance & New York City's Affordability Crisis*. <https://cnycn.creatavist.com/risingtides>

- Concerns
 - Continued erosion in renourished areas
 - Protection of places with historical and cultural significance
 - Reliance of Hilton Head Island on renourishment
 - Major cost
 - Supply of sand for nourishment
 - Vulnerability of low-lying land on the rear side of barrier islands

4.10.2: Additional Information

Beaufort County has not historically funded renourishment. Residents of Hilton Head and Daufuskie islands have been able to pay for their own renourishments. However, all of the County's barrier islands will be at an increasing risk for erosion as sea level rises. The developed islands of Harbor and Fripp will be particularly vulnerable.

Category 5: Research & Monitoring

Action 5.1: Environmental Monitoring

Identify or establish environmental monitoring programs in the area.

Environmental monitoring programs will help governments keep an eye on the health of the local environment. This sort of monitoring system is already important because of environmental stressors related to development. Climate change will further increase the need for monitoring, especially because no one can foretell exactly how local ecosystems will respond to such drastic changes.

5.1.1: Community Input

Community stakeholders provided the following comments on this adaptation action:

- Concerns
 - Health of marsh
 - Opportunity of marsh to migrate
 - Relation of environmental health to social vulnerability (see page 36)
 - Need to identify risk of sea level rise to environment and people
 - Liability to disclose and mitigate risk
 - Clean Water Act regulation data needs
 - Information transparency
- Suggestions
 - Monitor the health of salt marshes, water quality, and salt water intrusion
 - Track flooding locations, sea level trends, erosion patterns, and infrastructure vulnerabilities



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- Manage at state agency level
- Pay or manage volunteer community members to assist with data collection
- Identify marsh migration pathways and conserve lands
- Data sources/tools
 - [Sea Level Affecting Marshes Model](#) (SLAMM)⁴⁰
 - NOAA [Sea Level Rise and Coastal Flooding Impacts Viewer](#)⁴¹
 - [Surface elevation table](#) monitoring devices to monitor marsh movement
 - [Light Detection and Ranging](#) (LiDAR) elevation data

5.1.2: Additional Information

A considerable amount of data monitoring is already conducted by state agencies and scientific organizations. However, budget constraints create data gaps. Agencies have discretion in what they monitor, and do not watch everything. For example, SCDHEC monitors daily water quality on beaches for recreational use, but they do not test inland waterways. With the right expertise and agency oversight, other organizations can fill gaps. For example, the nonprofit organization [Charleston Waterkeeper](#) monitors recreational waters along the Ashley and Cooper rivers in Charleston, S.C.

The U.S. Climate Change Science Program, in Chapter 14 of [Coastal Sensitivity to Sea-Level Rise](#),⁴² proposed a comprehensive science strategy for better understanding sea level rise and its impacts on U.S. coasts. They suggest creating a denser network of basic observations and observing systems, developing time-series data on environmental change, and establishing baseline data for the coastal zone. Long-term monitoring programs are already in place at the nearby [ACE Basin National Estuarine Research Reserve](#) (NERR), which includes some of Beaufort County. The ACE Basin is an optimal site for research and monitoring to understand natural impacts from sea level rise, but monitoring will also be needed in the more developed environment of Beaufort County.

Beaufort County can supplement critical gaps or identify organizations to serve the need. Officials can work with [SCDNR](#), [NOAA](#), [SCDHEC](#), [USC-Beaufort](#), and other organizations to use monitoring projects in decision support systems that link environmental problems to policy solutions. In some cases, Beaufort County has already stepped in to provide funding for a data gap. This is the case for [Light Detection and Ranging](#) (LiDAR), a remote sensing technology used to create high quality digital elevation models of the land surface. Beaufort County

⁴⁰ NOAA Office for Coastal Management. 2014. "Sea Level Affecting Marshes Model." *Digital Coast*. <http://coast.noaa.gov/digitalcoast/tools/slamm>

⁴¹ NOAA Office for Coastal Management. 2014. "Sea Level Rise Viewer." *Digital Coast*. <http://coast.noaa.gov/digitalcoast/tools/slr>

⁴² Titus, James G., K. Eric Anderson, Donald R. Cahoon, Dean B. Gesch, Stephen K. Gill, Benjamin T. Gutierrez, E. Robert Thieler, and S. Jeffress Williams. 2009. [Coastal Sensitivity to Sea-Level Rise: A Focus on the Mid-Atlantic Region](#). U.S. Climate Change Science Program.



commissioned LiDAR in 2002 and again in 2013. Continued updates of the data will provide a better understanding of land-use change across decades.

Action 5.2: Trigger Points

Identify trigger points for changing policy.

Trigger points are monitoring thresholds used to avoid environmental or socioeconomic tipping points, wherein impacts become severe or irreversible. Trigger points can be used to justify and initiate proactive policy changes when a problem first develops or to avoid the consequences entirely. Awareness of thresholds and tipping points can be used to avoid the risky behavior of allowing consequences to accumulate until they are unmanageable. Many adaptation actions are designed to address problems associated with rapid sea level rise, not our current rate of slow change. However, sea level rise is expected to accelerate sometime during the 21st century. Therefore, establishing trigger points for adaptation actions can allow communities to strike agreement about policies that will preserve the status quo for as long as possible, while making a forward commitment to protect future populations.

5.2.1: Community Input

Community stakeholders provided the following comments on this adaptation action:

- Concerns
 - Lack of information to set trigger points
- Suggestions
 - Establish trigger points before engaging in public and private dialogue
 - Coordinate with state and municipal governments to ensure data consistency
 - Use currently collected data to propose trigger points

5.2.2: Additional Information

Trigger points are a key component of the [flexible adaptation pathways](#) approach.⁴³ This refers to adaptation approaches that focus on the uncertain and long-term nature of climate change by employing a risk-based decision framework involving thresholds and trigger points that enable the systematic adjustment of adaptation actions in response to new information and changing circumstances. The [Scottish ClimateXChange](#)⁴⁴ commissioned a helpful white paper on the topic, which includes specific case studies of this approach being planned or implemented in London, New York, and various locations in Australia and New Zealand. The authors note that the strategy keeps long term options open for as long as possible by setting the trigger points. Damage is minimized by preventing trends from exceeding unacceptable levels of risk.

⁴³ Moss, Anne and Suzanne Martin. 2012. "Flexible Adaptation Pathways." *ClimateXChange*. http://www.climateexchange.org.uk/files/9713/7365/7868/Flexible_adaptation_pathways.pdf

⁴⁴ Ibid.

Beaufort County could establish some simple parameters for trigger points based on risk levels. For example, a [project](#)⁴⁵ in Townsville, Australia, identifies levels of sea level rise associated with no action, nuisance management, intense management, and employing a retreat strategy. Different water levels and frequencies can be associated with each category of management and specific actions can be tied to each level. Nuisance management might involve stormwater upgrades, whereas intense management may require implementation of planning restrictions. The boundaries of each category are dependent upon the County Council's interpretation of acceptable risk and appropriate trigger points. Given socioeconomic impact data established in this project and otherwise available on Climate Central's [Surging Seas](#) tool,⁴⁶ the County can identify specific thresholds beyond which risk becomes unacceptable.

Category 6: Social Adaptation

Action 6.1: Social Vulnerability

Address the impacts on disadvantaged social groups, values, and symbolic places.

The consequences of coastal flooding are social as well as economic and ecological. The same hazard can affect groups of people differently depending on their capacity to act or their ability to recover quickly. For example, economically disadvantaged groups may have less of a monetary cushion to absorb the costs of flood damage or may not be able to afford living in safer locations outside of the flood zone. Others may be economically secure, but have few friends or family in the area to provide support.

Place-based adaptation priorities should be informed by local preferences and culture. For example, land on St. Helena Island has been traditionally passed down among local Gullah people for generations. The loss of this land to the sea would have a cultural significance above and beyond the normal impact, especially because development has already changed land ownership significantly in some parts of the County.

6.1.1: Community Input

Community stakeholders provided the following comments on this adaptation action:

- Concerns
 - Sea Islands' vulnerability to storm surge
 - Cultural significance of St. Helena communities
 - Cheap real estate in low lying areas

⁴⁵ Queensland Department of Environment and Heritage Protection. 2013. "Guideline for Preparing a Coastal Hazard Adaptation Strategy." *Queensland Government*. <http://www.ehp.qld.gov.au/coastalplan/pdf/adaptation-strategy-guideline.pdf>

⁴⁶ Climate Central. 2013. "South Carolina | Surging Seas: Sea Level Rise Analysis." <http://sealevel.climatecentral.org/ssrf/south-carolina>



- Displacement of culture and traditions, especially among Gullah people
- Suggestions
 - Use [Palmetto Breeze](#) bus system to evacuate vulnerable populations
 - Promote [heritage tourism](#) as alternative economy to preserve traditional culture
 - Collaborate with the [Gullah/Geechee Sea Island Coalition](#)
 - Examine family compound zones to assess cultural vulnerability to tidal flooding
 - Reference County Council's [dedication](#) to cultural protection as a disaster recovery function
 - Create a socioeconomic inventory of hazard and/or disaster preparedness among communities (e.g., through churches)

6.1.2: Additional Information

A common tool for identifying relative social vulnerability is the University of South Carolina Hazards and Vulnerability Research Institute's [Social Vulnerability Index](#), or SoVI.⁴⁷ This index synthesizes 30 socioeconomic variables, which research suggests contribute to a decrease in the community's capacity to respond to a disaster. The method ranks physical regions based on relative values, allowing a local community to understand who is most and least vulnerable within a county. This type of index can be used as the basis for prioritization of flood hazard assistance to areas with the most need.

Placed-based adaptation priorities can be established by using the assistance of local residents to map locations with special significance. However, this may require the County to consider how values differ among cultural sub-groups. One landmark may not mean much for the majority of residents, but it may be sacred to others.

Category 7: Transportation Adaptation

Action 7.1: Elevate Roads

Prioritize, elevate, and protect low-lying roads and causeways.

One key finding of the GIS analysis (see page 7) was the vulnerability of roadways to sea level rise in Beaufort County. Whereas most Beaufort County facilities and grounds are located out of harm's way, the state-owned transportation system runs across miles of low-lying islands, often connected by solitary causeways across the marshland. Many of these roads are already flooded during astronomical high tides. While the majority of these low-lying roads are non-critical routes, there are some hot spots along major arteries and evacuation routes in the lowcountry region.

⁴⁷ HVRI. 2013. "Social Vulnerability Index for the United States - 2006-10." *Hazards and Vulnerability Research Institute*. October 30. <http://webra.cas.sc.edu/hvri/products/sovi.aspx>



7.1.1: Community Input

Community stakeholders provided the following comments on this adaptation action:

- Concerns
 - Expensive
 - Low areas along US-17 (an evacuation route)
 - Impact near critical facilities such as roads, schools, and evacuation routes
 - Limited easements for adequate stormwater management along raised roads
- Suggestions
 - Create risk-based prioritization of infrastructure vulnerabilities
 - Build new roads at higher elevations
 - Use opportunities to raise roads, retrofit during maintenance and/or upgrades
 - Restore ferry service to culturally important islands (i.e., Daufuskie Island)

7.1.2: Additional Information

Beaufort County can work through the [Lowcountry Council of Governments](#) or local [Metropolitan Planning Organization](#) to identify top priorities from a risk perspective. Improvements to evacuation routes can be justified based on their significance to the County and their risk to elevated water levels. Up to two miles of roadway surface along evacuation routes are lower than 3 ft. above MHHW. There is already a high probability for flooding at this level during high tide. Even a small change in base sea level will make such flooding of the evacuation route more likely.

However, raising the surface of a road may pose challenges. For some roads to be raised, their shoulders must be widened. If the road runs along a causeway, this could mean that the road base needs to be extended into the wetlands. Depending on specific drainage conditions, road construction may also cause flooding on adjacent properties. An engineering assessment can provide more information about the opportunities to raise specific roadway segments.

Category 8: Water Management

Action 8.1: Low Impact Development

Use low impact development practices.

[Low Impact Development](#) (LID) is an integrated, comprehensive approach to land development or redevelopment that works with nature to manage stormwater as close to its source as



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possible.⁴⁸ LID practices can protect local water quality and reduce urban flooding through best practices in stormwater management.

8.1.1: Community Input

Community stakeholders provided the following comments on this adaptation action:

- Concerns
 - Water quality
 - Flooding due to poorly maintained retention ponds
 - Maintenance of ditches and piping
 - More intense rain storms already happening
- Suggestions
 - Require stormwater pond maintenance
 - Consider all stormwater infrastructure
 - Adjust design standards to anticipate sea level rise and precipitation conditions in 30-50 years
 - Prioritize which communities will receive public support of private infrastructure
 - Utilize community volunteers to maintain drainage system
 - Use LID as a comprehensive approach

8.1.2: Additional Information

Current Beaufort County stormwater regulations are based on the 95th percentile storm, or 1.95 in. of precipitation over a 24-hour period. The design of infrastructure does not factor in the potential for more intense rain or higher tides.

The [ACE Basin](#) and [North Inlet-Winyah Bay](#) National Estuarine Research Reserves, [the Center for Watershed Protection](#), the [S.C. Sea Grant Consortium](#), and partners have recently published an [LID manual](#)⁴⁹ for coastal South Carolina. [Appendix G](#) of this manual includes actions for adapting stormwater management to climate change. These include implementing LID practices at the site scale to reduce runoff volumes, modifying practices to prevent bypass during intense storm events, periodically revisiting [design storms](#) and mapped flood plains, using adaptable plants in place of native species, and using stormwater as a water source for irrigation.

Action 8.2: Water Control Structures

Build water control structures.

Water control structures control the flow of tidal water to keep it away from designated areas. There are a variety of structures used to control tidal water. The most prominent example is a

⁴⁸ EPA. 2014. "Low Impact Development (LID)." *United States Environmental Protection Agency*. October 3. <http://water.epa.gov/polwaste/green/>

⁴⁹ NERRS Science Collaborative. 2014. "Low Impact Development in Coastal South Carolina: A Planning and Design Guide." *North Inlet-Winyah Bay National Estuarine Research Reserve*. <http://www.northinlet.sc.edu/lid/>



tide gate, or barrier across small creeks or drainage ditches, that opens during outgoing tides and closes during incoming tides to let low-lying areas above mean low water drain effectively.⁵⁰

8.2.1: Community Input

Community stakeholders provided the following comments on this adaptation action:

- Concerns
 - Fish kills due to closed tide gates during low tide
- Suggestions
 - Understand drainage patterns
 - Use system of low-lying ditches and tide gates
 - Identify where tide gates are needed

8.2.2: Additional Information

Tide gates can function well as an option to reduce flooding in the coming decades, but sea level rise may eventually reduce their effectiveness. Taking into account analyses developed by [Georgia Sea Grant](#), the University of Georgia's [Carl Vinson Institute of Government](#), and [Stetson University](#), Tybee Island, GA, is [investing](#) in stormwater valve gates as a cost-effective option to reduce tidal flooding risks in low-lying neighborhoods.⁵¹ If sea level rises too quickly, it could overwhelm older structures. For example, a [scientific model](#) of the New Jersey Meadowlands identified a critical point at which sea levels could no longer be maintained by the tide gate.⁵²

Category 9: Miscellaneous

Action 9.1: Mitigation Programs

Support climate change mitigation programs.

Whereas climate adaptation prepares a community for the impacts of a changing climate, mitigation programs reduce the drivers of global change. Rising seas are currently caused by warmer temperatures due to the heightened presence of greenhouse gases in the atmosphere. Each community can do its part to reduce greenhouse gas emissions.

⁵⁰ Titus, James G., K. Eric Anderson, Donald R. Cahoon, Dean B. Gesch, Stephen K. Gill, Benjamin T. Gutierrez, E. Robert Thieler, and S. Jeffress Williams. 2009. [Coastal Sensitivity to Sea-Level Rise: A Focus on the Mid-Atlantic Region](#). U.S. Climate Change Science Program.

⁵¹ Evans, Jason, Rob McDowell, Chuck Hopkinson, Jill Gambill, David Bryant, Kelly Spratt, and Wick Prichard. 2013. "Tybee Island Sea Level Rise Adaptation Plan Executive Summary." *City of Tybee Island*. <http://www.cityoftybee.org/Assets/Files/CityManager/TISeaLevelRiseAdaptationPlanExecSumm201306.pdf>

⁵² Walsh, S. and R. Miskewitz. "Impact of sea level rise on tide gate function." [Journal of Environmental Science and Health](#). Part A, Toxic/Hazardous Substances & Environmental Engineering 48(4):453-463.



9.1.1: Community Input

Community stakeholders provided the following comments on this adaptation action:

- Concerns
 - Driver of sea level rise not addressed
- Suggestion
 - Reduce County greenhouse gas emissions

9.2.2: Additional Information

Emissions reduction is closely tied to energy efficiency. Several action items that reduce emissions are already identified in the [energy chapter](#) of the 2010 Beaufort County Comprehensive Plan.

Emission reductions can be prioritized by first conducting a greenhouse gas inventory. [Richland County](#) and the [City of Columbia](#) have conducted their own inventories that can be used as models. Richland County found that 74% of CO₂ emissions came from solid waste decomposition.⁵³ The City of Columbia found that its largest source was water delivery and wastewater facilities (totaling 57%).⁵⁴ More information about developing a greenhouse gas inventory, including tools, training, and funding sources can be found on the EPA's [website](#).⁵⁵

Action 9.2: Community Rating System

Increase the Community Rating System score.

The [Community Rating System](#) (CRS) is a voluntary incentive program built into FEMA's National Flood Insurance Program. The program seeks to encourage communities to initiate activities that exceed the minimum requirements of the National Flood Insurance Program. Completing activities will increase the CRS score of the community and provide discounts to the cost of flood insurance for policy holders in the community.

9.2.1: Community Input

Community stakeholders provided the following comments on this adaptation action:

- Concerns
 - High flood insurance costs
- Suggestions

⁵³ Richland County Baseline Emissions Inventory. 2009.

<http://www.richlandonline.com/Portals/0/Departments/Sustainability/Docs/RichlandCountyBaselineEmissionsInventoryReport.pdf>

⁵⁴ City of Columbia Baseline Emissions Inventory. 2011. http://www.columbiasc.net/depts/city-council/docs/old_downloads/09_06_2011_Agenda_Items/09_6_2011_Work_Session/Baseline%20Presentation.pdf

⁵⁵ USEPA. 2014. "Developing a Greenhouse Gas Inventory." *United States Environmental Protection Agency*. <http://www.epa.gov/statelocalclimate/local/activities/ghg-inventory.html>



- Use CRS program to lower insurance rates

9.2.2: Additional Information

The CRS activities are oriented towards reducing flood damage, strengthening the insurance aspects of the program, and encouraging a comprehensive approach to floodplain management. Although these activities are designed to address short term flood risk, many, like open space preservation, address long term sea level rise as well. More information on the program can be obtained from the FEMA [website](#)⁵⁶ and [CRS Resources](#),⁵⁷ which includes a community Quick Check guide to simplify the process.

Beaufort County has a Class 6 CRS classification, with goals of leading the community to be more disaster resistant by enhancing public safety and property protection, protecting the natural function of floodplains, and reducing flood insurance premiums. The County continuously strives to maintain and improve its CRS score by improving and complying with different CRS activities.

⁵⁶ FEMA. 2014. "National Flood Insurance Program Community Rating System." *Federal Emergency Management Agency*. <https://www.fema.gov/national-flood-insurance-program-community-rating-system>

⁵⁷ CRS Resources. 2014. <http://crsresources.org/>

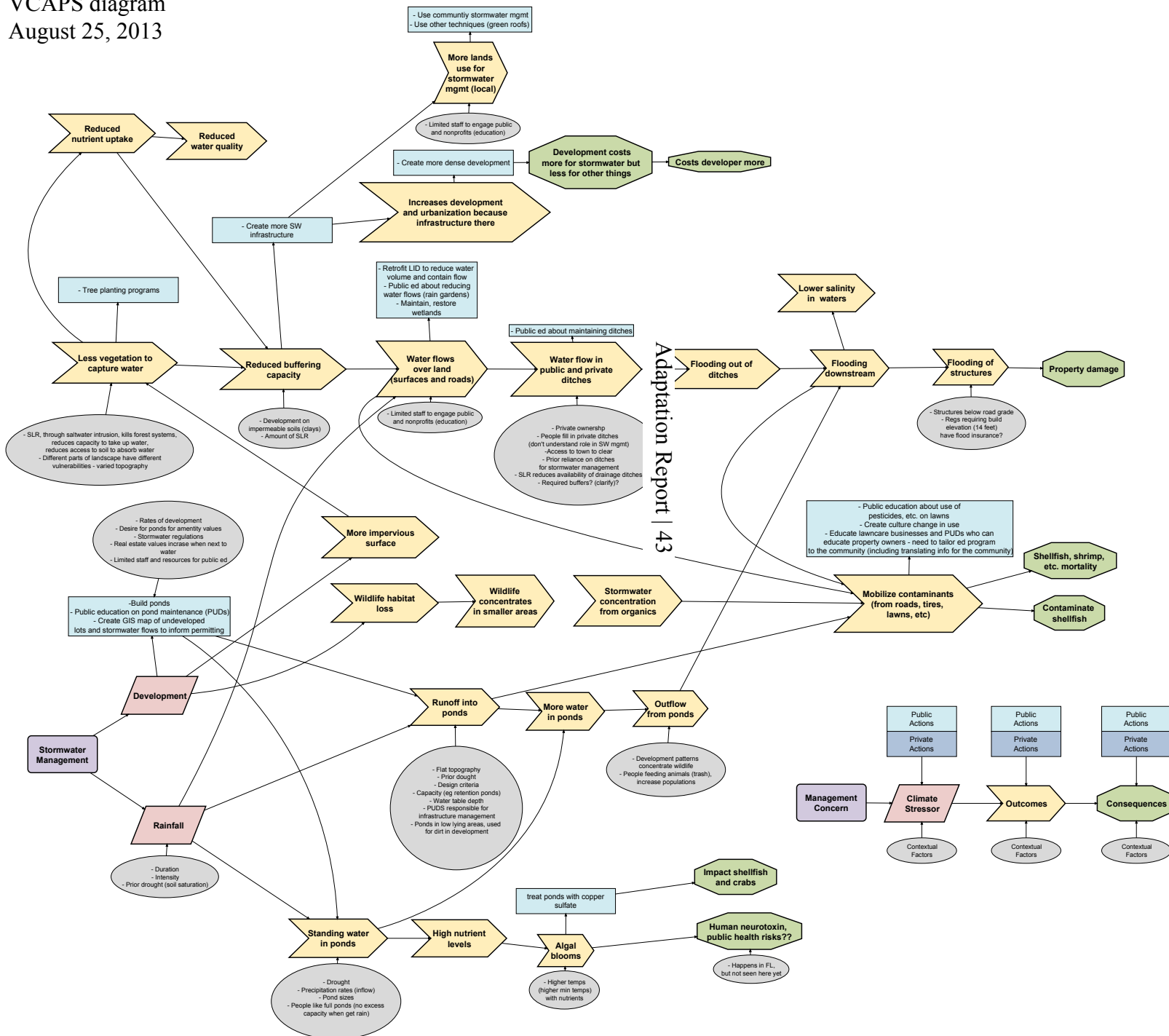


Appendix A

Climate change and stormwater management

VCAPS diagram

August 25, 2013

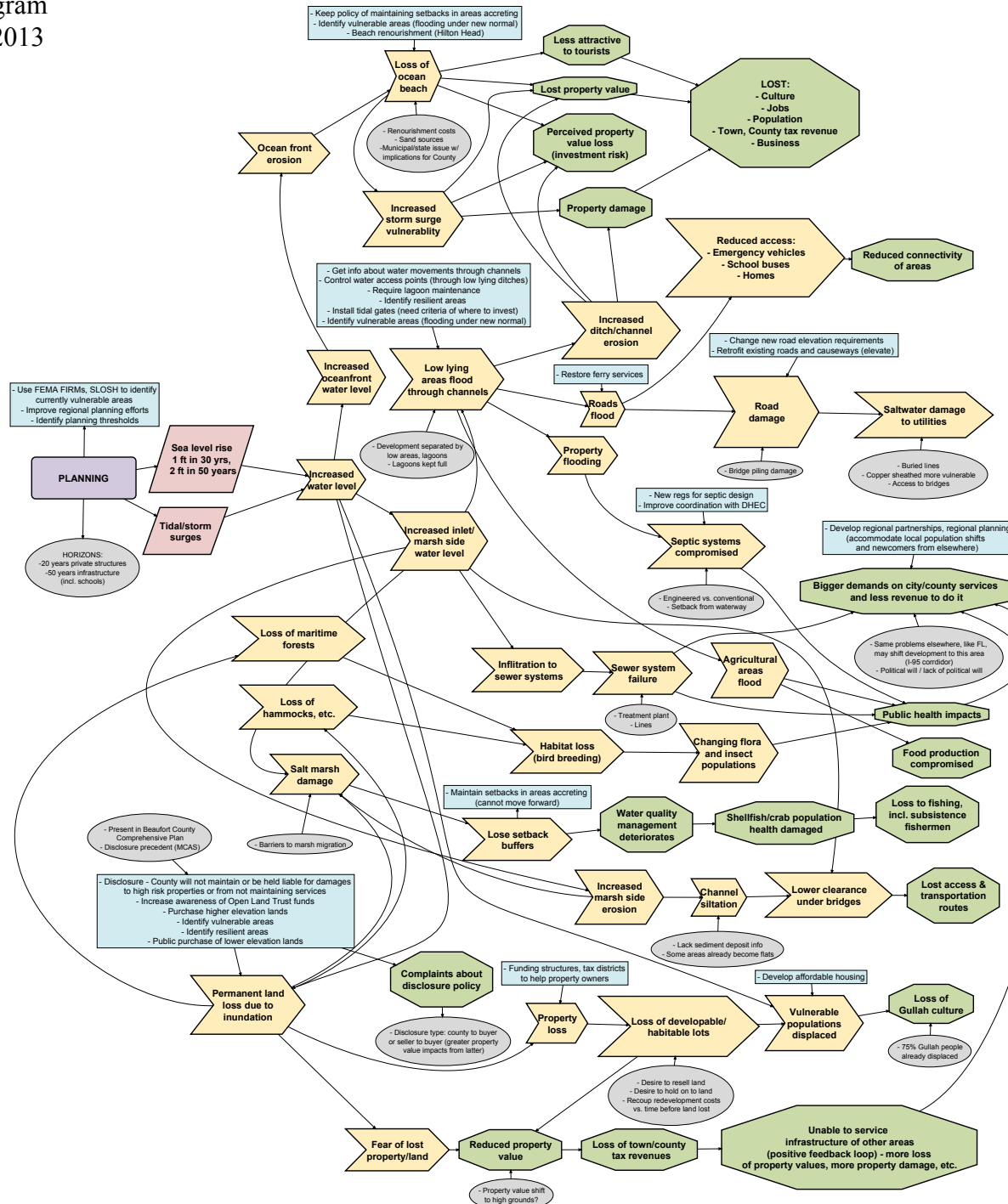


Appendix B

Climate change and sea level rise planning

VCAPS diagram

August 26, 2013



Appendix C

Announcement for Beaufort County Sea Level Rise Public Workshops

Sea Level Rise Adaptation Strategies for Beaufort County, S.C. Public Workshop

Southern county location:

Monday, August 25

1:00 PM – 4:00 PM

Large Meeting Room

Bluffton Branch Library

120 Palmetto Way

Bluffton, S.C. 29910

Northern county location:

Tuesday, August 26

1:00 PM – 4:00 PM

Large Meeting Room

St. Helena Branch Library

6355 Jonathan Francis Sr. Rd.

St. Helena, S.C. 29920

Cost: FREE

Registration required by August 20

For more information and to register, visit

<https://sites.google.com/site/beaufortslr/>

Questions? Send them to:

sean.bath@scseagrant.org or 843-953-2097

OBJECTIVES

- To share the latest science on sea level rise.
- To discuss Beaufort County vulnerabilities identified by a local group of interested staff and stakeholders.
- To solicit participants' additional input on adaptation strategies.
- To use participant input to write a plan for prioritized action for Beaufort County.

WHO SHOULD ATTEND

Municipal and county government officials and staff, interested citizens, natural resource managers, private sector associations and organizations

Organized and hosted by:



Social and Environmental
Research Institute



Appendix D

Agenda for Beaufort County Sea Level Rise Public Workshops

Beaufort County, SC, Public Workshop On Sea Level Rise Adaptation Strategies

Session 1: August 25, 2014
Bluffton Branch Library Large Meeting Room
120 Palmetto Way, Bluffton, SC 29910

Session 2: August 26, 2014
St. Helena Branch Library Large Meeting Room
6355 Jonathan Francis Sr. Rd., St. Helena, SC 29920

1:00	Welcome, Introductions, and Overview of Agenda	Robert Merchant , Beaufort County Planning Department Elizabeth Fly , SC Sea Grant Consortium and Carolinas Integrated Sciences and Assessments
1:20	Vulnerability to Sea Level Rise in Beaufort County	Elizabeth Fly , SC Sea Grant Consortium and Carolinas Integrated Sciences and Assessments Sean Bath , SC Sea Grant Consortium
1:45	Review of Working Group Findings and Adaptation Strategies	Jessica Whitehead , NC Sea Grant
2:00	Question and Answer	
2:15	Break	
2:25	Small Group Discussions	Facilitated group discussions about adaptation strategies, including a prioritization vote.
3:25	Report-outs and Full Group Discussion	Facilitators share key points of each small group with all participants.
3:50	Next Steps and Wrap-Up	Elizabeth Fly , SC Sea Grant Consortium and Carolinas Integrated Sciences and Assessments Robert Merchant , Beaufort County Planning Department



Social and Environmental
Research Institute






BEAUFORT COUNTY STORMWATER UTILITY
120 Shanklin Road
Beaufort, South Carolina 29906
Voice (843) 255-2805 Facsimile (843) 255-9478



MEMORANDUM

TO: County Council
Natural Resources Committee

FROM: Eric W. Larson, Stormwater Manager 

SUBJECT: Update on Stormwater Utility fee structure change, rate increase, and annual billing

DATE: January 4, 2016

On September 28, 2015, the County Council adopted a new Stormwater Utility rate structure change which included an increase in revenue. The annual tax notice, that includes the stormwater utility fee, was issued November 10, 2015. Since that time, the staff has been working with citizens making inquiries about their fees. We had approximately 165 requests in November and December. Below is a summary of the notable concerns and requests.

- An overwhelming majority of the questions have simply been about the new rate structure. Staff has explained the new structure over the phone and/or directed citizens to the county's website which contains detailed educational materials about the utility fee. No action was necessary.
- No system is perfect and the Utility did have inquiries that resulted in an adjustment to the billed amount. When requested, staff reevaluated all components of the bill including land use class, impervious area measurement, and gross area measurement. In some cases, the change was simply a change in residential class. In others, a change of area measurement was refined (by either impervious re-measurement or parcel line corrections in the GIS database) and the fee recalculated. This type of change is typical and happens every year, not just this year.
- The change in the rate structure to include a fee based on gross area did result in significantly higher bills on some tracts within the county. Staff was aware of this issue and briefed County Council during discussions and public hearings in August and September. Council will recall the discussion of the "rural and/or vacant 5+ acre tracts". Staff has met with a few of these landowners and reviewed their fee calculations and offered advice on how to refine / reduce the fee amount. In just a couple of cases, final action is pending.
- Marsh and eroded properties – There are 428 parcels of the 125,860 parcels in the county identified as being partially or fully salt marsh or beyond the mean high water. The reason for these are numerous. Some are old deeds that included the marsh and others are properties that are intentionally being retained by the owner in hopes that one day the beach will accrete and restore the beach front lot. At the time of the rate study, the tax assessor's database was not complete with regards to acreage of the portions in marsh, beyond the mean high water, etc., making it impractical for the SWU staff to make a determination of "net" gross acreage, or "high ground". As a result, staff was not able to make exclusions for these situations. This was explained to County Council during the public hearings and committee meetings. Stormwater Utility staff has since met with the Tax Assessor's office to define a plan of action to improve the database so that these determinations can be made in the future.

Next steps

Staff is currently working with our rate study consultant, Applied Technology and Management (ATM), to get a scope of work and fee to update the SWU credit manual. This is needed to re-format the credits with the new rate structure. As part of the credit update, it is planned to consider additional credit opportunities to address the concerns mentioned above and to incentive property owners to retrofit existing stormwater facilities to meet current design standards and MS4 requirements.



MEMORANDUM

TO: Natural Resource Committee of Beaufort County Council
FROM: Anthony Criscitiello, Planning Director
DATE: December 30, 2015
SUBJECT: Zoning Map Amendment for 20 \pm acres on the east side of S.C. Highway 170 (Okatie Highway), from T1 (Natural Preserve) to T2R (Rural)

PLANNING COMMISSION RECOMMENDATION from the excerpt of its December 7, 2015, draft minutes:

Mr. Anthony Criscitiello briefed the Commissioners on the rezoning. He noted that the parcel had been acquired by the Rural and Critical Land Preservation Board as T1. The County swapped a 40-acre parcel at Chechessee for the front 20 +/- acre portion on the subject parcel with the intent of building an animal shelter there. A rezoning to T2R (Rural) is needed for the proposed animal shelter. The back portion of the parcel will remain T1 for the purpose of building a park. The adjacent portion is zoned Planned Unit Development/PUD called Mailand Bluff where the front portion along Highway 170 has a commercial component along, with a residential component on the back that is age-restricted.

Discussion by the Commissioners included clarification of the property being included in a grouping of 2 other properties, the animal shelter will occupy a portion of the rezoned 20-acre portion, property owners listed in the meeting packet were notified and no responses were received by the Planning office, the proposed use under T2 is conditional, and clarification on 20 acres needed.

Public Comment:

1. Mr. James Glass, a resident at 12 Ashepoo Drive in the Rivers End subdivision, is against the shelter because he does not want to hear dogs barking. He is an animal lover and has two cats and a dog. His property backs up against the woods and it is a quiet neighborhood. He is for the shelter if it is placed on the southern portion with a big buffer along Heffalump Road.
2. Mr. Richard Manser, a resident at 18 Otter Creek, is fine with the shelter as long as it is placed on the south end of the property. He is against it if it is placed near his property.

Mr. Criscitiello noted that the site plan would be reviewed by the Staff Review Team, and input from the adjacent neighborhood will be taken into consideration. The property will be posted before the Team review begins, and public comment will be received at that time. At this time only the proposed rezoning will be addressed.

Mr. Semmler asked for clarification on County Council's intent for the property.

Ms. Allison Coppage, the Assistant Staff Attorney, drafted the Memorandum of Understanding that stated the intent of the County Council was to build a 20,000-square foot animal shelter in

partnership with the Hilton Head Humane Society. The concept would be a traditional animal shelter, with the other part of the building for the Humane Society.

Further discussion included a clarification of the Rural and Critical Land Preservation monies being involved and this rezoning (*Ms. Coppage noted that a land exchange occurred with the approval of the Rural and Critical Land Preservation Board*), clarifying that a larger footprint is allowed by the rezoning, and concern for buffering the abutting property owners from the shelter,

Motion: Mr. Ed Riley made a motion, and Mr. George Johnston seconded the motion, **to recommend approval to County Council on the Southern Beaufort County zoning map amendment/rezoning request for R600-013-000-0061 (a 20+/- acre portion from T1 to T2-R (Rural)). No further discussion occurred. The motion carried (FOR: Chmelik, Davis, Johnston, Riley, Semmler, and Walsnovich; ABSENT: Brown, Fireall, and Stewart).**

Ms. Davis emphasized that the abutting property owners concerns absolutely should be considered.

STAFF REPORT:

A. BACKGROUND:

Case No.	ZMA-2015-14
Applicant/Owner:	Beaufort County
Property Location:	East side of S.C. Hwy 170 (Okatie Hwy.) at Pritcher Point Road
District/Map/Parcel:	R600-013-000-0061-0000 (20± Portion)
Property Size:	97.7 acres
Future Land Use Designation:	Neighborhood/Mixed-Use
Current Zoning District:	T1 (Natural Preserve)
Proposed Zoning District:	T2R (Rural)

B. SUMMARY OF REQUEST:

In 2012, the County purchased 97.7 acres adjacent to the Okatie River through the Beaufort County Rural and Critical Lands Preservation (RCLP) Program. This property had previously been known as Okatie Marsh PUD, which was approved in 2008 as a mixed-use development for 64,000 sq. ft. of commercial uses and 395 dwelling units (single- and multi-family). The PUD had not begun to develop when bought by the County. Upon adoption of the Community Development Code and new zoning maps in December, 2014, the property was zoned T1 (Natural Preserve) to recognize its status as a RCLP purchase.

In April 2015, County Council adopted a Resolution (2015/14 – see attached) that transferred 43.57 acres of county-owned property in the Chechessee area to the RCLP Program in exchange

for 20 acres of this property in Okatie being made available for other general County purposes in addition to land preservation and passive park use. The County is seeking to rezone the 20 acres of this 97.7-acre parcel to T2R to allow the property to be used for a new Animal Services facility. No other uses for the property have been identified. The balance of the parcel (77.7 acres) will remain zoned T1.

C. ANALYSIS: Section 7.3.40 of the Community Development Code states that a zoning map amendment may be approved if the proposed amendment:

1. *Is consistent with and furthers the goals and policies of the Comprehensive Plan and the purposes of this Development Code.*

The property is designated Neighborhood/Mixed-Use on the Future Land Use Map, which reflects its previous PUD zoning. Passive parks and other government facilities are not incompatible with this designation.

2. *Is not in conflict with any provision of this Development Code, or the Code of Ordinances.*

The property can be developed in accordance with the CDC requirements for the T2R district.

3. *Addresses a demonstrated community need.*

The rezoning of a portion of this site will allow the property to be used in a manner that serves the needs of Beaufort County for a new Animal Services facility.

4. *Is required by changing conditions.*

(Not Applicable)

5. *Is compatible with existing and proposed uses surrounding the land subject to the application, and is the appropriate zone and uses for the land.*

The property is adjacent to the River End subdivision to the north, which is comprised of single-family homes on ¼-acre lots. To the south is the Osprey Point PUD, which is undeveloped but approved for 207,000 sq. ft. of commercial uses and 396 dwelling units that may be age-restricted. The proposed Animal Services facility will be built on the portion of the site at the intersection of S.C. Hwy. 170 and Pritcher Point Rd., across from the commercial component of Osprey Point and away from the River End subdivision. Any future development of the 20-ac. portion of the site will need to comply with the T2R requirements for allowable uses, setbacks, and buffers between abutting uses. Currently, all of the properties in the surrounding area that are not within PUDs are currently zoned either T1 (RCLP property) or T2.

6. *Would not adversely impact nearby lands.*

See response to item #5.

7. *Would result in a logical and orderly development pattern.*

The proposed rezoning will permit County facilities to be built on the portion of this property closest to S.C. Hwy. 170, across Pritcher Point Rd. from the planned commercial component of Osprey Point PUD. The remaining T1 portion of the site will be limited to preservation and/or passive park development. The rezoning will allow the development of a new Animal Services facility on a major arterial in the middle of the County.

8. *Would not result in adverse impacts on the natural environment – including, but not limited to, water, air, noise, storm water management, wildlife, vegetation, wetlands, and the natural functioning of the environment.*

No adverse impacts to the environment are anticipated by this rezoning. The 77.7-ac. portion of the property adjacent to the Okatie River will remain zoned T1. County projects must meet all stormwater management and resource protection standards of the CDC.

9. *Would result in development that is adequately served by public facilities (e.g. streets, potable water, sewerage, storm water management, solid waste collection and disposal, schools, parks, police, and fire and emergency facilities)*

Any development of this property will require staff review to ensure facilities are adequate to serve the use.

D. STAFF RECOMMENDATION:

After review of the guidelines set forth in Section 7.3.40 of the Community Development Code, staff recommends Approval of the rezoning request from T1 to T2R for a portion of R600-013-000-0061-0000 (20 ± acres).

E. ATTACHMENTS:

- Rezoning Application
- Zoning Map (existing and proposed)
- Resolution 2015/14

9. Explanation (continue on separate sheet if needed):

Rezoning 20± acre Portion to be used for a new Animal Services facility - Balance of 77.7 ~~acres~~ to remain zoned T1.

It is understood by the undersigned that while this application will be carefully reviewed and considered, the burden of proof for the proposed amendment rests with the owner.

Signature of Owner (see Item 5 on page 1 of 1) 11/9/15
Printed Name: Beaufort County Telephone Number: 843-255-2140
Address: Po Drawer 12281
Email: _____

Agent (Name/Address/Phone/email): Anthony Criscitiello, Planning Director

UPON RECEIPT OF APPLICATIONS, THE STAFF HAS THREE (3) WORK DAYS TO REVIEW ALL APPLICATIONS FOR COMPLETENESS. BEAUFORT COUNTY PLANNING COMMISSION MEETING SCHEDULES ARE LISTED ON THE APPLICATION PROCESS (ATTACHED).

COMPLETE APPLICATIONS MUST BE SUBMITTED BY NOON THREE WORK DAYS AND FOUR (4) WEEKS PRIOR FOR PLANNED UNIT DEVELOPMENTS (PUDs) -OR- THREE WORK DAYS AND THREE (3) WEEKS PRIOR FOR NON-PUD APPLICATIONS TO THE APPLICABLE PLANNING COMMISSION MEETING DATE.

PLANNED UNIT DEVELOPMENT (PUD) APPLICANTS ARE REQUIRED TO SUBMIT FIFTEEN (15) COPIES TO THE PLANNING DEPARTMENT. CONSULT THE APPLICABLE STAFF PLANNER FOR DETAILS.

FOR MAP AMENDMENT REQUESTS, THE PLANNING OFFICE WILL POST A NOTICE ON THE AFFECTED PROPERTY AS OUTLINED IN DIV. 7.4.50 OF THE COMMUNITY DEVELOPMENT CODE.

CONTACT THE PLANNING DEPARTMENT AT (843) 255-2140 FOR EXACT APPLICATION FEES.

FOR PLANNING DEPARTMENT USE ONLY:

Date Application Received:
(place received stamp below)

Date Posting Notice Issued:

Application Fee Amount Received:

Receipt No. for Application Fee:

Map of the 1533 area in Sevier County, Tennessee, showing various land parcels and their zoning designations. The map includes a compass rose, a north arrow, and a scale bar. The parcels are labeled with their respective zoning codes: T2R (Rural), T1NP (Natural Preserve), and PUD (Existing Planned Unit Development). The map also shows the location of the McGarvey's Corner and the intersection of Highway 278 and Highway 279. The map is prepared by the Sevier County GIS Division, dated November 19, 2015.

RESOLUTION 2015 / 14

A RESOLUTION TRANSFERRING 43.57 ACRES OF PROPERTY LOCATED ON THE
CHECHESSEE RIVER TO THE
BEAUFORT COUNTY RURAL AND CRITICAL LANDS PROGRAM

WHEREAS, Beaufort County Council purchased 43.57 acres in the Chechessee area known more specifically as R600 010 000 001A 0000 ("Chechessee Property") by use of \$850,000.00 from the County's General Reserve Fund; and

WHEREAS, the County, through the Beaufort County Rural and Critical Lands Program, purchased 97.7 acres along S.C. Highway 170 known more specifically as R 600 013 000 0061 0000 ("170 Property"); and

WHEREAS, it has been determined by the Rural and Critical Lands Board that the Chechessee Property is located in a corridor with longstanding land protection and would further contribute to the Rural and Critical Lands Program accomplishments in the Chechessee watershed; and

WHEREAS, in order to ensure that the development limitations imposed by the Rural and Critical Lands Program are transferred and binding on the Chechessee Property, it is necessary for some form of legal consideration to be provided from the Rural and Critical Lands Program; and

WHEREAS, in order to provide for this legal consideration while not utilizing program funding that could otherwise go towards property acquisition or site development, it has been recommended by the Rural and Critical Lands Board that approximately 20 acres of the 170 Property nearest the highway and possessing the least amount of conservation value be subdivided from the remaining 77.7 acres as consideration for the Chechessee Property; and

WHEREAS, the twenty acres to be subdivided from the 170 Property may only be used for other County purposes as would be appropriate for property purchased from the County's General Reserve Fund; and

WHEREAS, Beaufort County Council has determined that it is in its best interests to authorize the exchange of this 20 acres of the 170 Property as the consideration for the inclusion of the entire 43.57 acres of the Chechessee Property so as to further promote the mission of the Rural and Critical Lands Program.

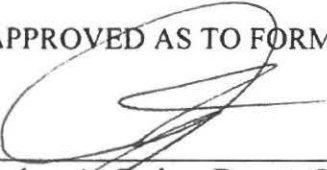
NOW, THEREFORE, BE IT RESOLVED by Beaufort County Council that it hereby declares that the entirety of the 43.57-acre Chechessee Property shall be included in the inventory of the Rural and Critical Lands Program and further, that the County Administrator is hereby authorized to take such action as is necessary to have 20 acres of the 170 Property subdivided for other general County purposes.

ADOPTED BY BEAUFORT COUNTY COUNCIL, BEAUFORT, SOUTH
CAROLINA, ON THIS 13th DAY OF APRIL, 2015.

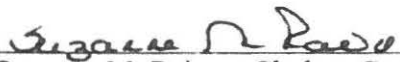
COUNTY COUNCIL OF BEAUFORT COUNTY

BY: 
D. Paul Sommerville, Chairman

APPROVED AS TO FORM:


Joshua A. Gruber, Deputy County Administrator
Special Counsel

ATTEST:


Suzanne M. Rainey, Clerk to Council



COUNTY COUNCIL OF BEAUFORT COUNTY
BEAUFORT COUNTY PLANNING DIVISION

Beaufort County Government Robert Smalls Complex
100 Ribaut Road, Room 115
Post Office Drawer 1228, Beaufort SC 29901-1228
Phone: (843) 255-2140 • FAX: (843) 255-9432

November 20, 2015

**RE: Notice of Public Meetings to Consider a Southern Beaufort County Map
Amendment/Rezoning Request for R600 013 000 0061 0000 (20+/- Acre Portion,
formerly known as Okatie Marsh Planned Unit Development/PUD; From T1 to
T2-Rural; Owner/Applicant: Beaufort County.**

Dear Property Owner:

In accordance with the Beaufort County Community Development Code (CDC), Section 7.4.50, a public hearing is required by the Beaufort County Planning Commission and the Beaufort County Council before a map amendment/rezoning proposal can be adopted. You are invited to attend the following meetings and public hearings to provide comment on the subject proposed map amendment in your neighborhood. This rezoning request is for the purpose of constructing a new Beaufort County Animal Shelter and Control Facility. A map of the property is on the back of this letter.

1. The Beaufort County Planning Commission (public hearing) – Monday, December 7, 2015, at 6:00 p.m. in the County Council Chambers, located on the first floor of the Beaufort County Administration Building, 100 Ribaut Road, Beaufort, SC.
2. The Natural Resources Committee of the County Council – Monday, January 4, 2016, at 2:00 p.m. in the Executive Conference Room, located on the first floor of the Beaufort County Administration Building, 100 Ribaut Road, Beaufort, SC.
3. Beaufort County Council – generally meets second and fourth Mondays at 5:00 p.m. in the County Council Chambers of the Beaufort County Administration Building, 100 Ribaut Road, Beaufort, SC. County Council must meet three times prior to making a final decision on this case. Please call (843) 255-2140 to verify the exact dates and locations.

Documents related to the proposed amendment are available for public inspection between 8:00 a.m. and 5:00 p.m., Monday through Friday, in the Beaufort County Planning Department office located in Room 115 of the Beaufort County Administration Building. If you have any questions regarding this case, please contact the Planning Department at (843) 255-2140.

Sincerely,

Anthony J. Criscitiello
Planning Director

Attachment: Locational Map on back of letter

PROPERTY OWNERS NOTIFIED OF MAP AMENDMENT/REZONING REQUEST -- R600 13 61 (20+/- Acre Portion*)

PIN	Owner	Mailing Address	City	State	ZIP
R600 13A 25	4 ASHEPOO ASSOCIATES LLC	61 WHITEOAKS CIR	BLUFFTON	SC	29910
R600 13A 122	ALTIZER HARRY G SHIRLEY L	POST OFFICE BOX 12	TILLMAN	SC	29943
R600 13A 49, 83, 90, 125	AMH 2015-1 BORROWER LLC	30601 AGOURA ROAD STE 200D	AGOURA HILLS	CA	91301-2148
R600 13A 141	ANDRADE FELISBERTO	3224 LONG VALLY ROAD	CHARLOTTE	NC	28270
R600 13A 20	ANTON ALEX F	14 ASHEPOO DRIVE	OKATIE	SC	29909
R600 13A 143	BARKER NANCY F	2 ARCHERS CREEK COURT	BLUFFTON	SC	29910
R600 13A 61, 65 & 94	BEAUFORT COUNTY	100 RIBAUT ROAD	BEAUFORT	SC	29902
R600 13 60	BEAUFORT COUNTY OPEN LAND TRUST INC	POST OFFICE BOX 75	BEAUFORT	SC	29901
R600 13A 67	BEAUFORT-JASPER WATER & SEWER AUTHOR	6 SNAKE ROAD	OKATIE	SC	29909
R600 13A 57	BECKER KRIS JENNIFER	2 CHEEHAW DRIVE	BEAUFORT	SC	29909
R600 13 2	BENNETT JOHN J	218 DELOSS DRIVE	RIDGELAND	SC	29936
R600 13A 121	BLUFFTON RENTAL HOMES LLC	POST OFFICE BOX 2057	BEAUFORT	SC	29901
R600 13A 17	BRIDGERS MARY ALICE JUDY	20 ASHEPOO DRIVE	OKATIE	SC	29909
R600 13A 132	BROCE JOSEPH A SANDRA H	16 EDISTO COURT	OKATIE	SC	29909
R600 13A 152	CALVERT MICHAEL E & RACHEL ANN	149 PICKETT CREEK LN	BLUFFTON	SC	29909
R600 13A 46	CONNOLLY GERARD M SHERRI L	26 CHEEHAW DRIVE	OKATIE	SC	29909
R600 13A 18	CRONIN HUGH KEVIN & RAQUELL JEANNE	18 ASHEPOO DRIVE	OKATIE	SC	29909
R600 13A 124	CUBIAS GIOVANI & SHALA ARLENE	12 OTTER CREEK DRIVE	OKATIE	SC	29909
R600 13A 120	DALTON JAY F & JOHN F	4 OTTER CREEK DRIVE	OKATIE	SC	29909
R600 13A 164	DENNIS JASON J SAUNDRA G	16 PARROT CREEK DRIVE	OKATIE	SC	29909
R600 13A 81	DIEHL DAVID SARAH	6 CAPERS CREEK DRIVE	OKATIE	SC	29909
R600 13A 165	DOCTOR FATEMAH T	18 PARROT CREEK DRIVE	OKATIE	SC	29909
R600 13A 86	EADY WILLIE L MARGO O	16 CAPERS CREEK DRIVE	BLUFFTON	SC	29909
R600 13A 144	FAIRVIEW PARK INC % REBECCA D ALBRIG	5 HICKORY TRACE	BLUFFTON	SC	29910
R600 13A 123	FAIRVIEW PARKS INC % REBECCA D ALBRI	POST OFFICE BOX 2057	BEAUFORT	SC	29901
R600 13A 47	FENTON FOREST T III MARGARET H JTR	2886 JUNIPER LANE	DAVIE	FL	33330
R600 13A 162	FREDRIKSON ERIK C PHYLLIS L	12 PARROT CREEK DRIVE	OKATIE	SC	29909
R600 13A 50	GALIPEAU SHAWN LISA	16 CHEEHAW DRIVE	OKATIE	SC	29909
R600 13A 21	GLASS JAMES SCOTT	12 ASHEPOO DRIVE	OKATIE	SC	29909
R600 13A 23	GOULDIE DAVID M	8 ASHEPOO DRIVE	OKATIE	SC	29909
R600 13A 88	HAMILTON DANNY LEE SHEILA M	20 CAPERS CREEK DRIVE	OKATIE	SC	29909
R600 13A 92	HARBISON CHRISTIAN	28 CAPERS CREEK DRIVE	BLUFFTON	SC	29909

PROPERTY OWNERS NOTIFIED OF MAP AMENDMENT/REZONING REQUEST -- R600 13 61 (20+/- Acre Portion*)

PIN	Owner	Mailing Address	City	State	ZIP
R600 13A 54	HARDEE ELIZABETH M	8 CHEEHAW DRIVE	OKATIE	SC	29909
R600 13A 128	HARDIN JEFFREY S JENNI M	20 OTTER CREEK DRIVE	OKATIE	SC	29909
R600 13A 52	HARKNESS GEORGE C KATHIE R	12 CHEEHAW DRIVE	OKATIE	SC	29909
R600 13A 53	HAWKINS WILLIAM A CAROL M	10 CHEEHAW DRIVE	BLUFFTON	SC	29909
R600 13A 87	HELLSTROM JOHN C ROSANA E	18 CAPERS CREEK DRIVE	OKATIE	SC	29909
R600 13A 48	HILLS JACK D MARTHA B	20 CHEEHAW DRIVE	OKATIE	SC	29909
R600 13A 126	HOLLAND DENNIS A	16 OTTER CREEK DRIVE	OKATIE	SC	29909-3753
R600 13A 24	HOOD WILLIAM A VELMA D	6 ASHEPOO DRIVE	OKATIE	SC	29909
R600 13A 89	HOYOS ROLANDO J NATALIA M	22 CAPERS CREEK DRIVE	OKATIE	SC	29909
R600 13A 146	JACKSON SANDRA L	663 SAMS POINT ROAD	BEAUFORT	SC	29907
R600 13A 131	JEFFERSON JENICE J WIGGINS ANDRE L	14 EDISTO COURT	OKATIE	SC	29909
R600 13A 35	JOHNSON OLIVER M TERESA D	1 CHEEHAW DRIVE	OKATIE	SC	29909
R600 13A 137	JONES PATTERSON SIMPSON & NEWTON P	POST OFFICE DRAWER 7049	HILTON HEAD ISLAND	SC	29938
R600 13A 142	KOTT ANTHONY R II & IVY M	1 EDISTO COURT	BLUFFTON	SC	29909
R600 13A 51	LAGUE BEATRICE R	14 CHEEHAW DRIVE	OKATIE	SC	29909
R600 13 6	LCP III LLC % J NATHAN DUGGINS III	POST OFFICE BOX 2888	GREENSBORO	NC	27402
R600 13A 84	LITCHFIELD STEPHEN SARAH	12 CAPERS CREEK DRIVE	OKATIE	SC	29909
R600 13A 134 & 140	LOPEZ MIGUEL	25 QUEENS WAY	BLUFFTON	SC	29910
R600 13A 135	MACKENZIE TIM J KELLI L	1913 JIMMYS ROAD	NEW BERN	NC	28560
R600 13A 166	MAHON RAYMOND PHILIP & MARY CATHERINE	20 PARROT CREEK DRIVE	OKATIE	SC	29909
R600 13 372	MALIND BLUFF DEVELOPMENT LLC	100 NORTH GREENS STREET, STE 600	GREENSBORO	NC	27401
R600 13A 127	MANSER FAMILY IRREVOCABLE TRUST	18 OTTER CREEK DRIVE	OKATIE	SC	29909
R600 13A 145	MCCLURE BRIAN P CARRIE J	6 ARCHERS CREEK COURT	OKATIE	SC	29909
R600 13A 133	MELTON JOSEPH WALLACE & ELIZABETH ANN	18 EDISTO COURT	OKATIE	SC	29909
R600 13A 138	MIDDLETON ANGELA D	9 EDISTO COURT	OKATIE	SC	29909
R600 13A 139	MITCHELL JONATHAN OZANICH MYLA J	7 EDISTO COURT	BLUFFTON	SC	29909
R600 13A 163	MITCHELL RICHARD M MARTIN SHIRLEY A	14 PARROT CREEK DRIVE	OKATIE	SC	29909
R600 13A 66	MOLANDE GROUP LTD	7555 JACKS LANE	CLAYTON	OH	45315
R600 13A 55	MUSE WILLIAM DAVID DONNA MARIE	6 CHEEHAW DRIVE	OKATIE	SC	29909
R600 13 2A, 3C & 5	OLSEN EDWIN R SUE SCHRANK	1 HEFFALUMP ROAD	OKATIE	SC	29909
R600 13A 96	RICHERT ROBERT S JOLYNN ETAL	1043 SNYDER DRIVE	LEESPORT	PA	19533-9000

PROPERTY OWNERS NOTIFIED OF MAP AMENDMENT/REZONING REQUEST -- R600 13 61 (20+/- Acre Portion*)

PIN	Owner	Mailing Address	City	State	ZIP
R600 13A 16	SILCOX DONALD W MARY M	21 ASHEPOO DRIVE	OKATIE	SC	29909
R600 13A 85	SIMS ERIC HAGA SANDRA C	703 KENSINGTON BLVD	BLUFFTON	SC	29910
R600 13A 91	SMERALDI MARK A HEGER MELISSA E J	26 CAPERS CREEK DRIVE	BLUFFTON	SC	29909
R600 13A 56	SOLOMON BARRY M	4 CHEEHAW DRIVE	OKATIE	SC	29909
R600 13A 22	STAPLES ROSS H	10 ASHEPOO DRIVE	OKATIE	SC	29909
R600 13A 130	STRAWN EVELYN L	12 EDISTO COURT	OKATIE	SC	29909
R600 13A27	TAKACH DOUGLAS M LOU ANNE	1 ASHEPOO DRIVE	OKATIE	SC	29909
R600 13A 28	TIGER JAYSON MCKINLAY & RUSANNE RYCHELLE	POST OFFICE BOX 47	BLUFFTON	SC	29910
R600 13A 19	TORBORG STEVEN G & PAMELA J	16 ASHEPOO DRIVE	OKATIE	SC	29909
R600 13A 136	TORO JAIME RITA M	13 EDISTO COURT	OKATIE	SC	29909
R600 13A 82	VAN WILLIAM G LESLIE H	POST OFFICE BOX 5948	HILTON HEAD ISLAND	SC	29938
R600 13A 80	WAPLES KATHARINE M	4 CAPERS CREEK DRIVE	OKATIE	SC	29909
R600 13A 129	WATTERS JEFFREY ROBERT	22 OTTER CREEK DRIVE	BLUFFTON	SC	29909
R600 13A 26	WHITE KEVIN W & HEIDI LEE	2 ASHEPOO DRIVE	OKATIE	SC	29909
R600 13A 79	YOUMANS KEVIN ALEXANDER	2 CAPERS CREEK DRIVE	OKATIE	SC	29909