Addendum

Preferred BMPs

Based on communication with the Town of Hilton Head Engineering Department, the preferred BMPs selected from the BMP Matrix to be considered for possible implementation are the following:

1. Combination of the Pond Bank Retrofits and the Control Structure Retrofits for the existing ponds located on Town property in the Shelter Cove area.
2. Retrofit of bio-swales or bioretention along Shelter Cove Lane
3. Retrofit of bioretention in the Hwy 278 medians
4. Retrofit of bio-swales or bioretention in Town property along William Hilton Pkwy

The following addendum provides additional information on the above BMPs, including construction cost estimates, predicted removal efficiencies, and required permitting efforts.

Pond Bank and Outlet Structure Retrofits.

Construction Cost Estimate

The construction cost estimates provided are for budget purposes only and include contingency and soft cost estimates. The estimates are intended to include work commonly associated with similar scope construction projects based on assumed scopes. Individual bid quantities were lumped into more general categories and historical bid prices were used to estimate costs. Actual designs have not been completed and the construction scopes are subject to change.

	Units	Unit Cost	Quantity	Cost
Mobilization	EA	$5,000	1	$5,000
Site Prep/Restoration Erosion & Sediment Control	EA	$15,000	1	$15,000
Clearing	AC	$5,000	1	$5,000
Excavation	CY	$20	4,500	$90,000
Finish Grading - Pond Banks	SY	$5	2,200	$11,000
Drainage Structures	EA	$15,000	1	$15,000
		Subtotal		$141,000
Contingency (20%)				$28,200
Engineering/Legal/Admin (20%)				$28,200
		Total		**$197,400**

Figure 1 - Pond Bank and Outlet Structure Retrofit Cost Estimate

BMP Removal Efficiency

The bacteria treatment efficiency for this BMP was evaluated using a couple different methods. The first method used was to estimate the treatment removal efficiency for the proposed pond and compare it to the estimated treatment for the existing pond. Background data in the Beaufort County *Manual for Stormwater Best Management Practices* and a publication by the Center for Watershed Protection (CWP) titled *National Pollutant Removal Performance Database* were used to estimate the two conditions. The Beaufort County BMP Manual credits 80% bacteria removal efficiency for wet ponds assuming they maintain a sufficiently sized permanent pool, utilize an outlet control structure, and

include littoral shelves. The 80% value was selected based on data from the CWP that indicates a mean removal efficiency of 70% with a standard deviation of 32%. It is assumed that well maintained ponds incorporating all three design components will perform at the higher end of the efficiency range, and ponds without two or three of the components would function at the lower end of the range. Based on these data and assumptions, it was estimated that the current pond would have a bacteria removal efficiency of 50% and the retrofitted pond would have a removal efficiency of 80%.

	Estimated Bacteria Removal Efficiency
Existing Pond	50%
Retrofitted Pond	80%

Figure 2 - Estimated Bacteria Removal Efficiencies for Ponds in Existing and Retrofit Conditions

The second evaluation method was to calculate and compare the estimated volume discharges from the existing pond and the retrofitted pond. It is believed that increases in freshwater volume to saltwater rivers are decreasing the die-off rate of bacteria by temporarily reducing the salinity of the receiving waters. Increases in freshwater runoff from development also increase the total annual load of pollutant reaching the receiving waters. For these reasons, estimating the reduction in volume discharge from the pond due to retrofits could be considered a direct estimate of the improvement to water quality in the receiving waters. The volume reduction was estimated using the ICPR model of the existing and proposed ponds developed to conceptually size the outlet structure (see Figure 7 in the main report). Total volume discharged from the existing pond and the proposed retrofitted pond are below for the 95th percentile storm (1.95 inches):

Condition	Discharge Volume (acre-ft)
Existing Pond	0.8
Retrofitted Pond	0.5

Figure 3 - Estimated Discharge Volume for Memorial Park Pond in Existing and Retrofit Conditions.

Design Scope and Permitting Required

Implementation of this retrofit BMP will require a design scope as follows:

- Survey of existing pond banks including top of bank, normal water level, and bottom of bank.
- Survey of existing outlet pipe
- Tree & topo survey of area surrounding pond to allow for design of proposed littoral shelves
- Wetland and critical area research/determination
- Detailed hydrologic and hydraulic modeling of the pond and contributing watershed (existing conditions)
- Detailed hydrologic and hydraulic modeling of the pond in proposed retrofit condition to size outlet structure
- Grading plan for proposed pond bank retrofits
- Erosion control plan for NPDES permitting
- Outlet structure and general construction details

The proposed improvements may require permitting with the following agencies.

- SCDHEC-OCRM for land disturbance – NPDES permitting
- SCDHEC-OCRM for critical area disturbance permit (likely not needed, but would be needed if any improvements are proposed at the discharge end of the pipe or if pond is deemed critical area)
- Town of Hilton Head Island Natural Resources Department
- Wetland impact permitting (if pond is deemed wetlands)

Retrofit Bio-swales or Bioretention (Shelter Cove Lane).

Construction Cost Estimate

The construction cost estimates provided are for budget purposes only and include contingency and soft cost estimates. The estimates are intended to include work commonly associated with similar scope construction projects based on assumed scopes. Individual bid quantities were lumped into more general categories and historical bid prices were used to estimate costs. Actual designs have not been completed and the construction scopes are subject to change. The cost estimate for the Shelter Cove bio-swales/bioretention was prepared assuming 0.10 acre size, located adjacent to one existing curb inlet. The cost estimate can be multiplied by each proposed location to get a total cost based on the total number of locations planned.

	Units	Unit Cost	Quantity	Cost
Mobilization	EA	$5,000	1	$5,000
Site Prep/Restoration Erosion & Sediment Control	EA	$5,000	1	$5,000
Excavation	CY	$20	350	$7,000
Finish Grading	SY	$5	530	$2,650
Modify Drainage Structures	EA	$3,000	1	$3,000
Bioretention Media Backfill	CY	$15	175	$2,625
Landscaping	SY	$12	530	$6,360
		Subtotal		$31,635
Contingency (20%)				$6,327
Engineering/Legal/Admin (25%)				$7,909
		Total		**$45,871**

Figure 4- Cost Estimate (per locations) for Bioretention along Shelter Cove Lane

* Note there will be some cost benefit to combining multiple sites into one project.

BMP Removal Efficiency

The bacteria treatment efficiency for this BMP was evaluated using the Beaufort County *Manual for Stormwater Best Management Practices.* The BMP Manual credits 70% bacteria removal efficiency for bioretention BMPs assuming they are sized properly based on the contributing area, and that they are properly design considering the seasonal high groundwater, the maximum ponding depth, soil media, landscaping, and detention time. Documented removal efficiencies ranger between 35% to 70%, but proper design will assure removal efficiencies at the 70% level.

Bio-swales tend to be a less effective than bioretention because they do not detain the runoff and filter it as effectively. Removal efficiencies range from 10% to 35%, and the Beaufort County BMP Manual credits only a 10% removal efficiency. Where possible, a full bioretention BMP should be used over the bio-swales, although as a pre-treatment device in-line with other BMPs, the bio-swales could be useful.

	Estimated Bacteria Removal Efficiency
Bioretention	70%
Bio-Swale	10%

Figure 5- Estimated Bacteria Removal Efficiencies for Bio-Swales and Bioretention

Design Scope and Permitting Required

Implementation of this retrofit BMP will require a design scope as follows:

- Utility locate
- Tree & topo survey of existing road edge, curb line, right-of-way, and utilities for the planned bioretention area
- Soil tests for permeability and seasonal high water table
- Detailed hydrologic and hydraulic modeling of the curb inlet in existing conditions
- Detailed hydrologic and hydraulic modeling of the proposed bioretention BMP added to the road drainage system.
- Grading plan for the proposed bioretention
- Erosion control plan for NPDES permitting
- General construction details
- Landscape plan

The proposed improvements may require permitting with the following agencies.

- SCDHEC-OCRM for land disturbance – NPDES permitting
- Coordination with service providers for all wet and dry utilities possibly affected
- Town of Hilton Head Island Natural Resources Department
- Easements and approvals from the road owner (Shelter Cove Harbour Company, at the time of this report)

Retrofit Bioretention in Highway Medians (William Hilton Pkwy).

Construction Cost Estimate

The construction cost estimates provided are for budget purposes only and include contingency and soft cost estimates. The estimates are intended to include work commonly associated with similar scope construction projects based on assumed scopes. Individual bid quantities were lumped into more general categories and historical bid prices were used to estimate costs. Actual designs have not been completed and the construction scopes are subject to change. The cost estimate for the William Hilton Parkway median bioretention was prepared assuming a single location with a 0.10 acre BMP size. The construction cost is highly dependent on the presence of existing utilities and the proximity of an available stormwater outfall. The cost estimate prepared is for the location surveyed as part of this study, which was located just east of the central entrance to the Shelter Cove mall and has a grate inlet in the median for easy stormwater outfall. The cost estimate can be multiplied by each proposed location to get a total cost based on the total number of locations planned.

	Units	Unit Cost	Quantity	Cost
Mobilization	EA	$5,000	1	$5,000
Site Prep/Restoration Erosion & Sediment Control	EA	$5,000	1	$5,000
Excavation	CY	$20	200	$4,000
Finish Grading	SY	$5	530	$2,650
Modify Drainage Structures	EA	$3,000	1	$3,000
Bioretention Media Backfill	CY	$15	150	$2,250
Landscaping	SY	$10	530	$5,300
		Subtotal		$27,200
Contingency (20%)				$5,440
Engineering/Legal/Admin (25%)				$6,800
		Total		**$39,440**

Figure 6 - Cost Estimate (per location) for Bioretention in Highway Medians

* Note there will be some cost benefit to combining multiple sites into one project.

BMP Removal Efficiency

The bacteria treatment efficiency for this BMP was evaluated using the Beaufort County *Manual for Stormwater Best Management Practices.* The BMP Manual credits 70% bacteria removal efficiency for bioretention BMPs assuming they are sized properly based on the contributing area, and that they properly design considering the seasonal high groundwater, the maximum ponding depth, soil media, landscaping, and detention time. Documented removal efficiencies ranger between 35% to 70%, but proper design will assure removal efficiencies at the 70% level.

	Estimated Bacteria Removal Efficiency
Bioretention	70%

Figure 7 - Estimated Bacteria Removal Efficiencies for Bioretention BMPs

Design Scope and Permitting Required

Implementation of this retrofit BMP will require a design scope as follows:

- Utility locate
- Tree & topo survey of existing road edge, median, and utilities for the planned bioretention area
- Soil tests for permeability and seasonal high water table
- Detailed hydrologic and hydraulic modeling of the existing conditions
- Detailed hydrologic and hydraulic modeling of the proposed bioretention BMP added to the road drainage system.
- Grading plan for the proposed bioretention
- Erosion control plan for NPDES permitting
- General construction details
- Landscape plan

The proposed improvements may require permitting with the following agencies.

- SCDHEC-OCRM for land disturbance – NPDES permitting
- Coordination with service providers for all wet and dry utilities possibly affected
- Town of Hilton Head Island Natural Resources Department
- SCDOT encroachment permitting

Retrofit Bio-swales or Bioretention (Town Property along William Hilton Pkwy).

Construction Cost Estimate

The construction cost estimates provided are for budget purposes only and include contingency and soft cost estimates. The estimates are intended to include work commonly associated with similar scope construction projects based on assumed scopes. Individual bid quantities were lumped into more general categories and historical bid prices were used to estimate costs. Actual designs have not been completed and the construction scopes are subject to change. The cost estimate for the Shelter Cove bio-swales/bioretention was prepared assuming 0.80 acre size, located adjacent to one existing curb inlet. The cost estimate can be multiplied by each proposed location to get a total cost based on the total number of locations planned.

	Units	Unit Cost	Quantity	Cost
Mobilization	EA	$5,000	1	$5,000
Site Prep/Restoration Erosion & Sediment Control	EA	$5,000	1	$5,000
Excavation	CY	$15	3,800	$57,000
Finish Grading	SY	$5	3,800	$19,000
Modify Drainage Structures	EA	$3,000	1	$3,000
Bioretention Media Backfill	CY	$15	1,300	$19,500
Landscaping	SY	$12	3,800	$45,600
		Subtotal		$154,100
Contingency (20%)				$30,820
Engineering/Legal/Admin (15%)				$23,115
		Total		**$208,035**

Figure 8 - Cost Estimate (per location) for Bioretention on Town Property along William Hilton Pkwy

* Note there will be some cost benefit to combining multiple sites into one project.

BMP Removal Efficiency

The bacteria treatment efficiency for this BMP was evaluated using the Beaufort County *Manual for Stormwater Best Management Practices.* The BMP Manual credits 70% bacteria removal efficiency for bioretention BMPs assuming they are sized properly based on the contributing area, and that they properly design considering the seasonal high groundwater, the maximum ponding depth, soil media, landscaping, and detention time. Documented removal efficiencies ranger between 35% to 70%, but proper design will assure removal efficiencies at the 70% level.

Bio-swales tend to be a less effective than bioretention because they do not detain the runoff and filter it as well. Removal efficiencies range from 10% to 35%, and the Beaufort County BMP Manual credits only a 10% removal efficiency. Where possible, a full bioretention BMP should be used over the bio-swales, although as a pre-treatment device in-line with other BMPs, the bio-swales could be useful.

	Estimated Bacteria Removal Efficiency
Bioretention	70%
Bio-Swale	10%

Figure 9 - Estimated Bacteria Removal Efficiencies for Bioretention and Bio-Swale BMPs

Design Scope and Permitting Required

Implementation of this retrofit BMP will require a design scope as follows:

- Utility locate
- Tree & topo survey of existing road edge, curb line, right-of-way, and utilities for the planned bioretention area
- Soil tests for permeability and seasonal high water table
- Detailed hydrologic and hydraulic modeling of the curb inlet in existing conditions
- Detailed hydrologic and hydraulic modeling of the proposed bioretention BMP added to the road drainage system.
- Grading plan for the proposed bioretention
- Erosion control plan for NPDES permitting
- General construction details
- Landscape plan

The proposed improvements may require permitting with the following agencies.

- SCDHEC-OCRM for land disturbance – NPDES permitting
- SCDHEC-OCRM for critical area disturbance permit (likely not needed, but would be needed if a new discharge point to the marsh is needed)
- Coordination with service providers for all wet and dry utilities possibly affected
- Town of Hilton Head Island Natural Resources Department
- SCDOT encroachment permitting