Beaufort County, SC Stormwater Design

Explanation of the review process and its application

Bluffton Gateway Development Plan

Battery Creek retrofit 319(h) grant project

Okatie River West retrofit 319(h) grant project

What is Bluffton Gateway?

- 2 big box retail stores
  - Wal-Mart (185,000 sq. ft.)
  - Sam's Club (136,000 sq. ft.)
  - Associated Parking (800,000 sq. ft.)
- Fuel Station
- 2 outparcels (7,000 sq. ft.)

- Site is 64 acres w/ 15 ac. wetland = 78% coverage w/ improvements

The Regulation

- Code of Ordinances
  - Chapter 106 – Community Development Code

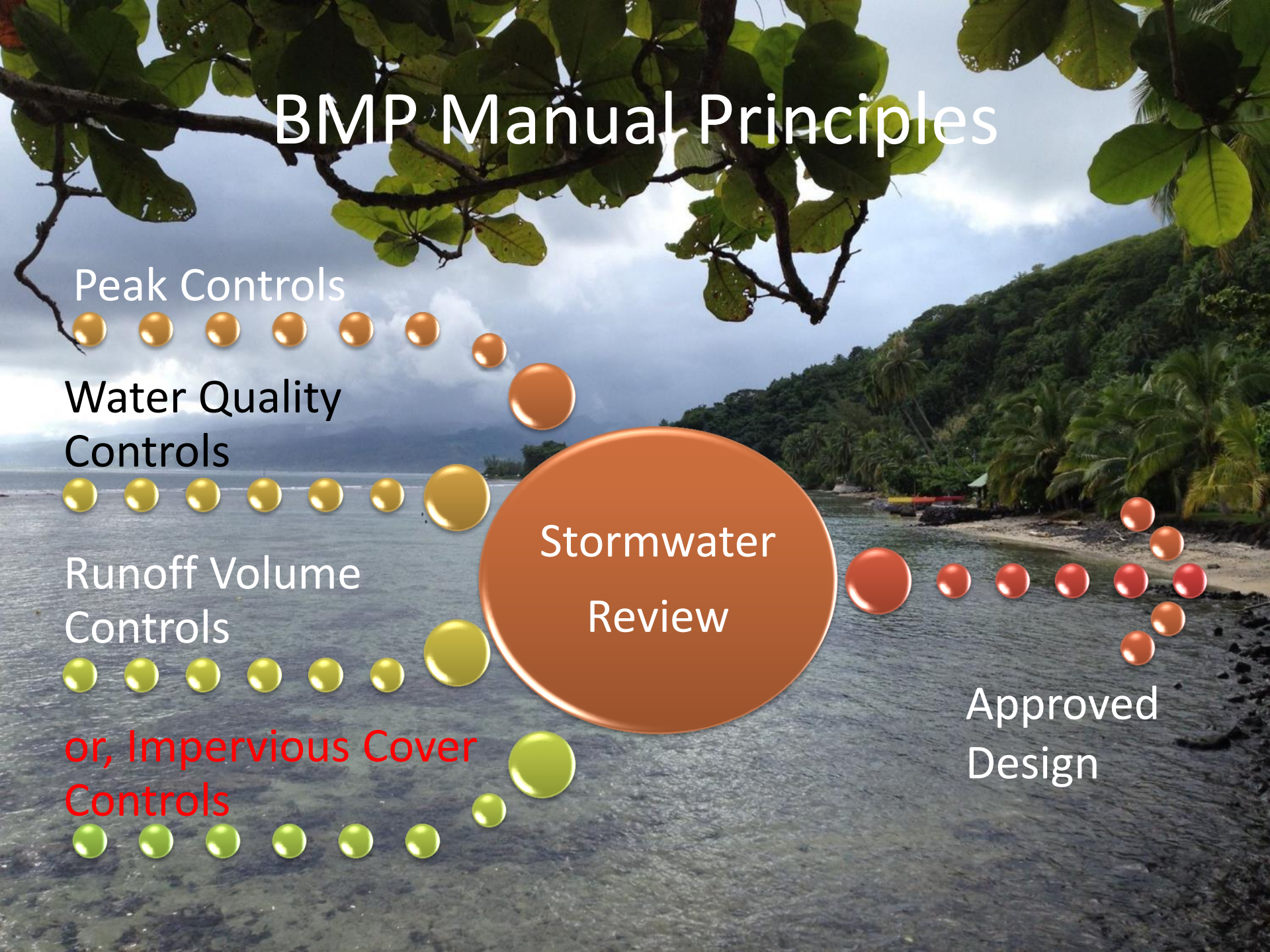
    Division 5.12.30 – Stormwater Stds.

    B. All these standards are to be achieved in accordance with the latest version of the County's **Manual for Stormwater Best Management and Design Practices (BMP)**, which is incorporated herein by reference.

The Regulation, cont.

C. All development and redevelopment shall utilize and integrate Stormwater BMPs which are appropriate to their location and environment, and contribute to the overall character of a proposal. BMPs implemented at the development scale shall be integrated … to the maximum extent technically feasible … . BMPs may be designed as a singular practice or as part of various supplemental pre-treatment BMPs in series to achieve the runoff volume, runoff pollution load, and peak runoff rate control standards.

BMP Manual Principles



Site Plan

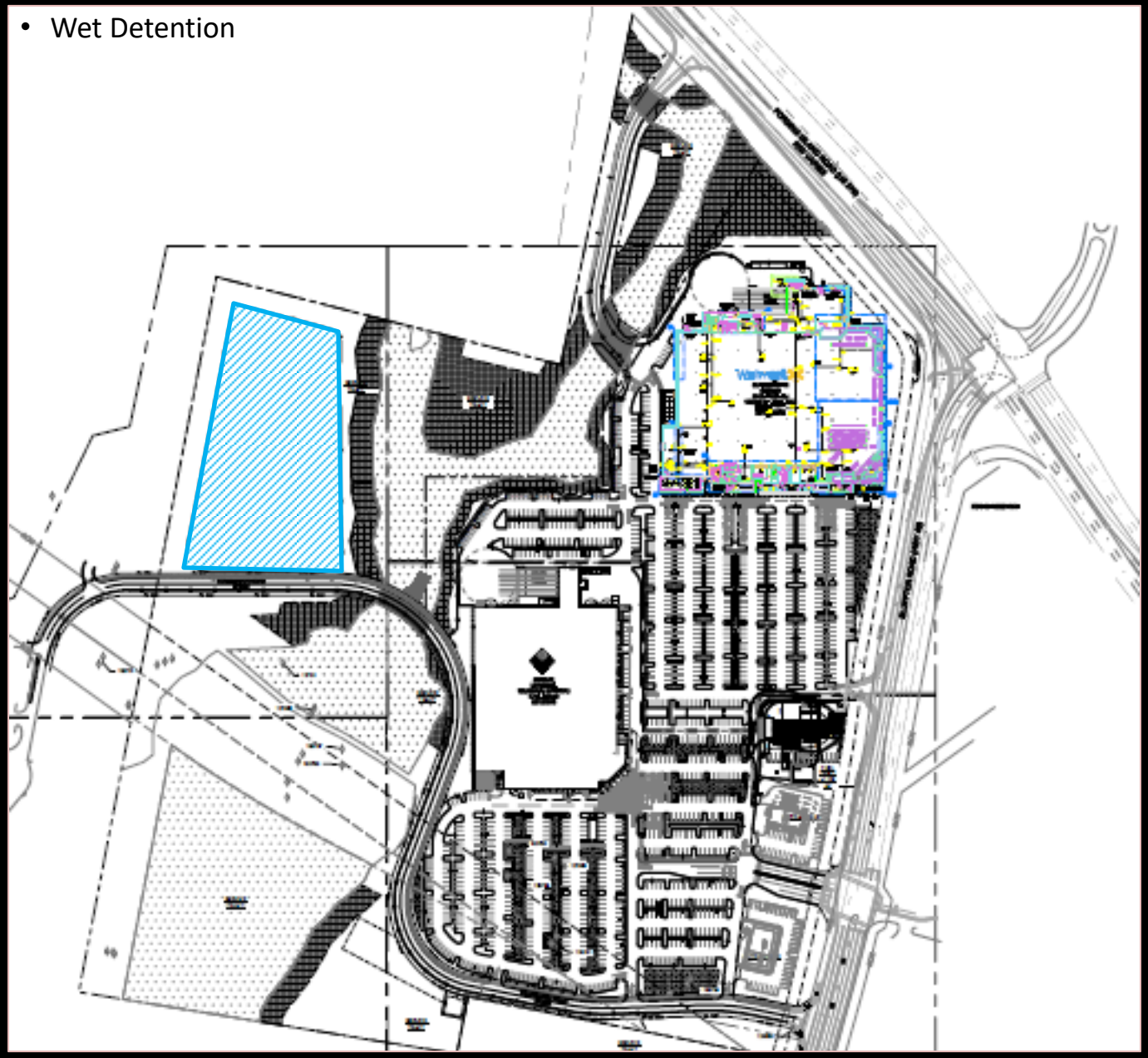
- Thoroughfare buffer
- Wetland Preservation and buffer
- Irrigation re-use
- Wet Detention
- Rain Gardens
- Porous Pavements

BMP Manual Guidelines

- Peak Controls
  - BMP Manual Section 2.6.1 - The design storm criteria to be used in calculations for the sizing of peak attenuation and volume control BMPs is to limit the post-development runoff for multiple storm events including the 2-, 10-, 25-, 50 and **100-year**/24-hour storms to the predevelopment rates.

Peak Control

- Wet Detention

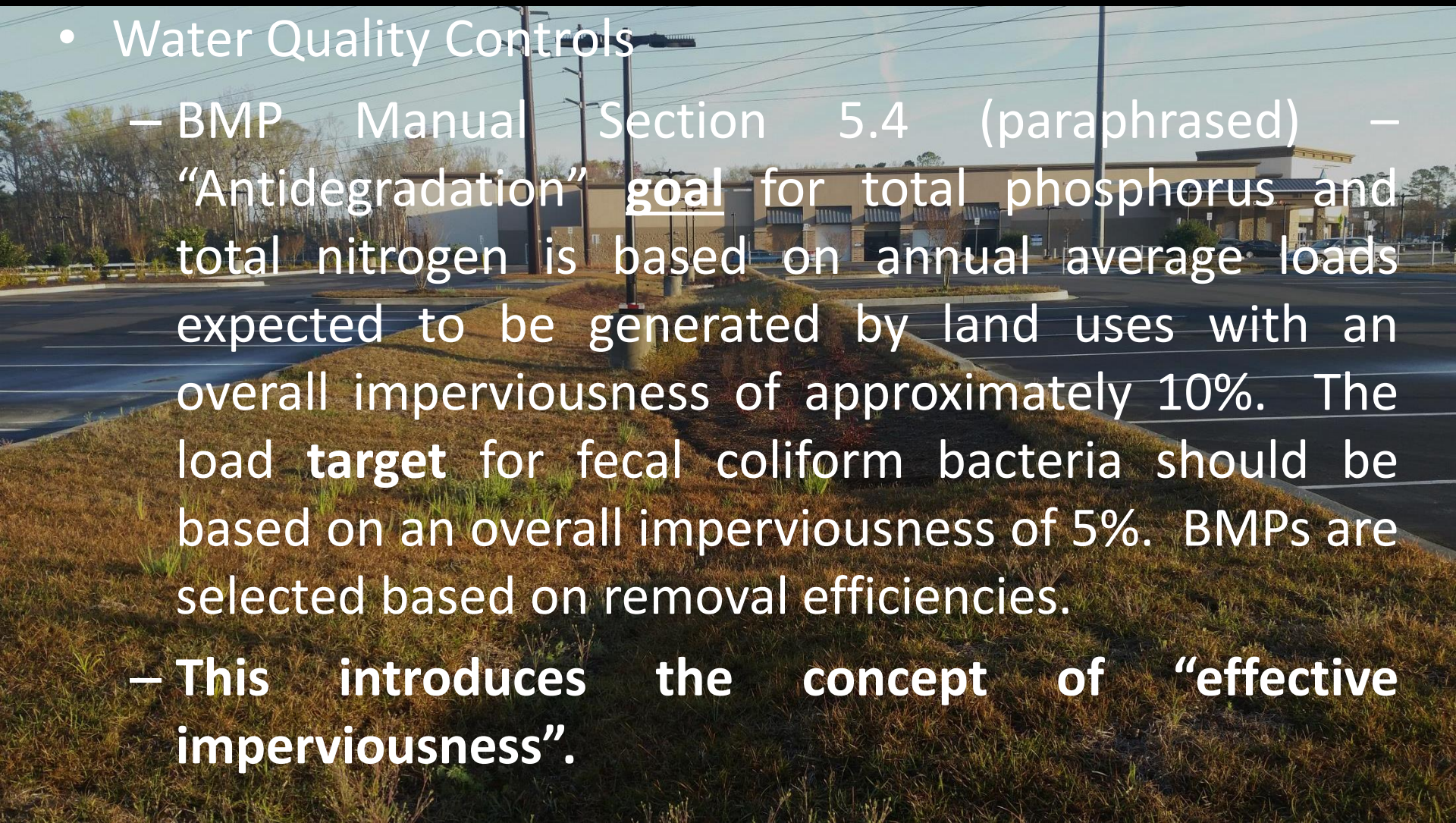


Bluffton Gateway - Peak Control

- Ordinance requires the 2-, 10-, 25-, 50 and 100-year/24-hour events to be considered
- Design exceeded our requirements
  - 100 yr. storm was added to code AFTER this project

Storm Events	Pre Development Discharge (cfs)	Post Development Discharge (cfs)
2-Year, 24-Hour	18.45	16.04
10-Year, 24-Hour	42.39	41.98
25-Year, 24-Hour	66.91	61.12
50-Year, 24-Hour	92.68	92.10
100-Year, 24-Hour	122.02	138.04

BMP Manual Guidelines



- Water Quality Controls
  - BMP Manual Section 5.4 (paraphrased) – "Antidegradation" **goal** for total phosphorus and total nitrogen is based on annual average loads expected to be generated by land uses with an overall imperviousness of approximately 10%. The load **target** for fecal coliform bacteria should be based on an overall imperviousness of 5%. BMPs are selected based on removal efficiencies.
  - **This introduces the concept of "effective imperviousness".**

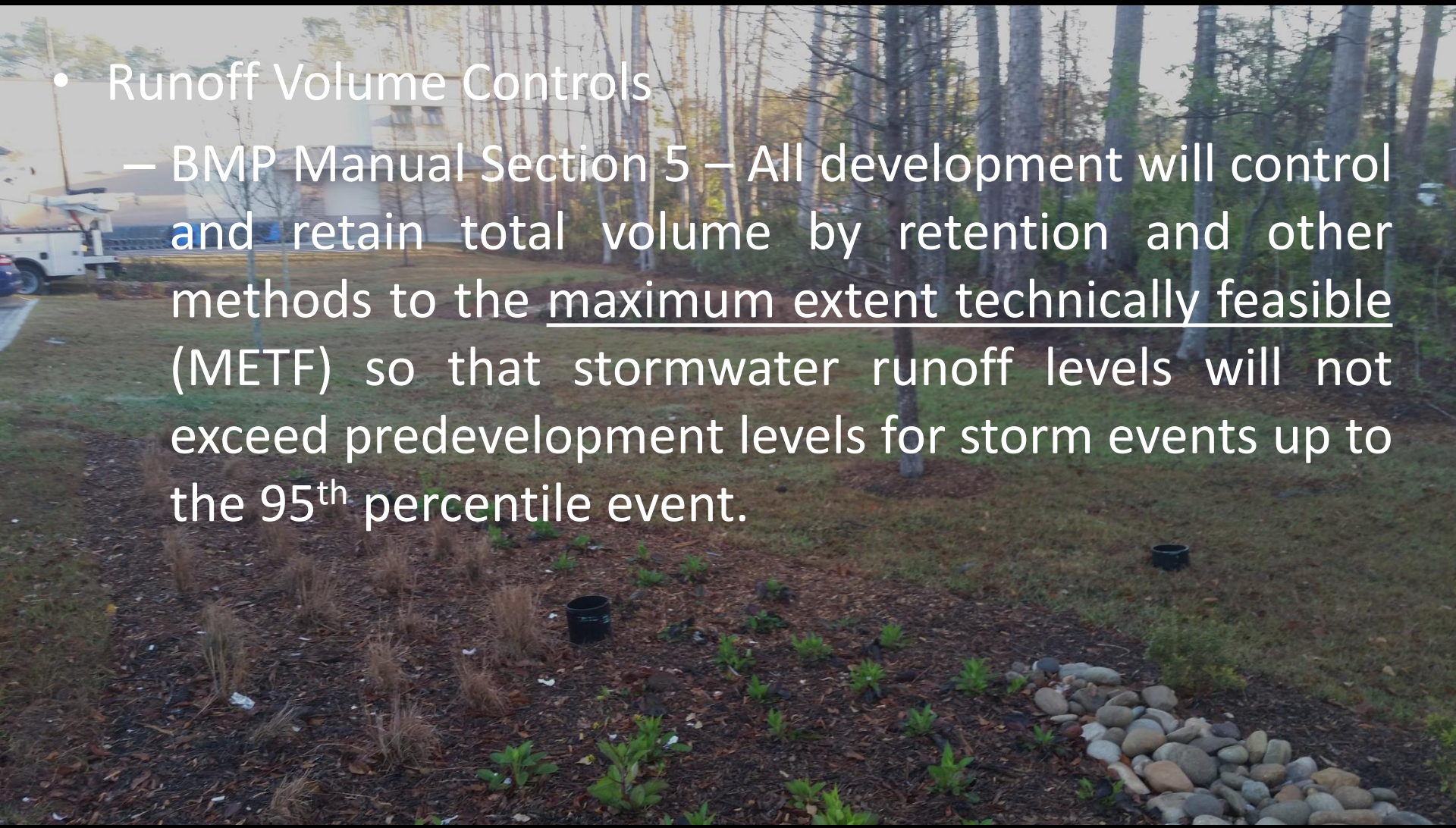
Water Quality Control

- Wet Detention
- Rain Gardens
- Porous Pavements

Bluffton Gateway - Water Quality Control

- Design utilizes a Wet Detention Pond as primary BMP for nutrient and bacteria removal
- This analysis considers % impervious cover
- Consultant submitted analyses for 10%, 14.4%, 15.2%, 19.8%, 24.5% effective impervious area
- Any level of effective impervious at or below 19.8% meet this criterion

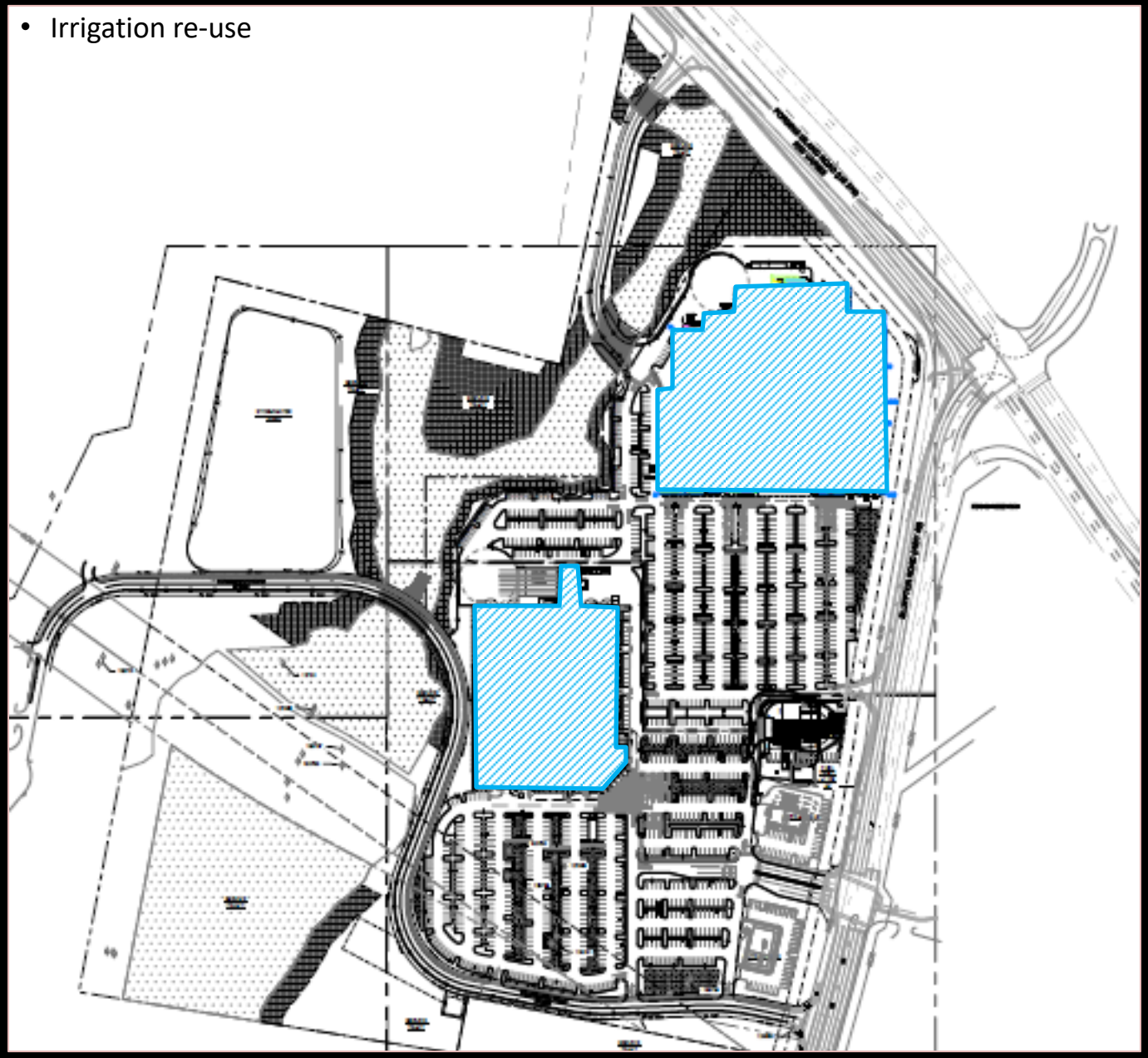
BMP Manual Guidelines



- Runoff Volume Controls
  - BMP Manual Section 5 – All development will control and retain total volume by retention and other methods to the maximum extent technically feasible (METF) so that stormwater runoff levels will not exceed predevelopment levels for storm events up to the 95th percentile event.

Runoff Volume Control

- Irrigation re-use



Bluffton Gateway - Runoff Volume Control

- Based on the 95th percentile design storm event, the design determined:
  - Pre-Development Volume = 24,189 CF
  - Post-Development Volume = 67,631 CF
  - Increase = 43,442 CF
- Irrigation capture and reuse BMP provides 156,233 CF storage
- Therefore, 100% of site runoff volume is captured

Equivalent/Effective Impervious Cover (EIC)

- Metric that measures how effectively impervious surface runoff is reduced relative to pre-development pervious surface runoff

BMP Manual Guidelines

- Impervious Cover Controls
  - BMP Manual Section 5.1 (paraphrased) – Volume control **target** is a threshold of 10% effective impervious area. It is consistent with the overall framework of the BMP reviews for water quality, which allow for anti-degradation loads of total phosphorus (total P), total nitrogen (total N), and fecal coliform from proposed development up to the uncontrolled load expected from a 10 percent impervious development.

The Logic of the "10% Rule"

- …runoff volume controls (are) a different way to handle stormwater runoff and **not an additional set of controls**.
- …by utilizing volume controls, most water quality and some of the peak shaving requirements are also addressed.
- …in addressing a runoff volume requirement, volume quantity and quality **requirements can be integrated by utilization** of Equivalent (effective) Impervious Cover (method).

- D. Ahern, R. Wagner, R. Klink (2012)

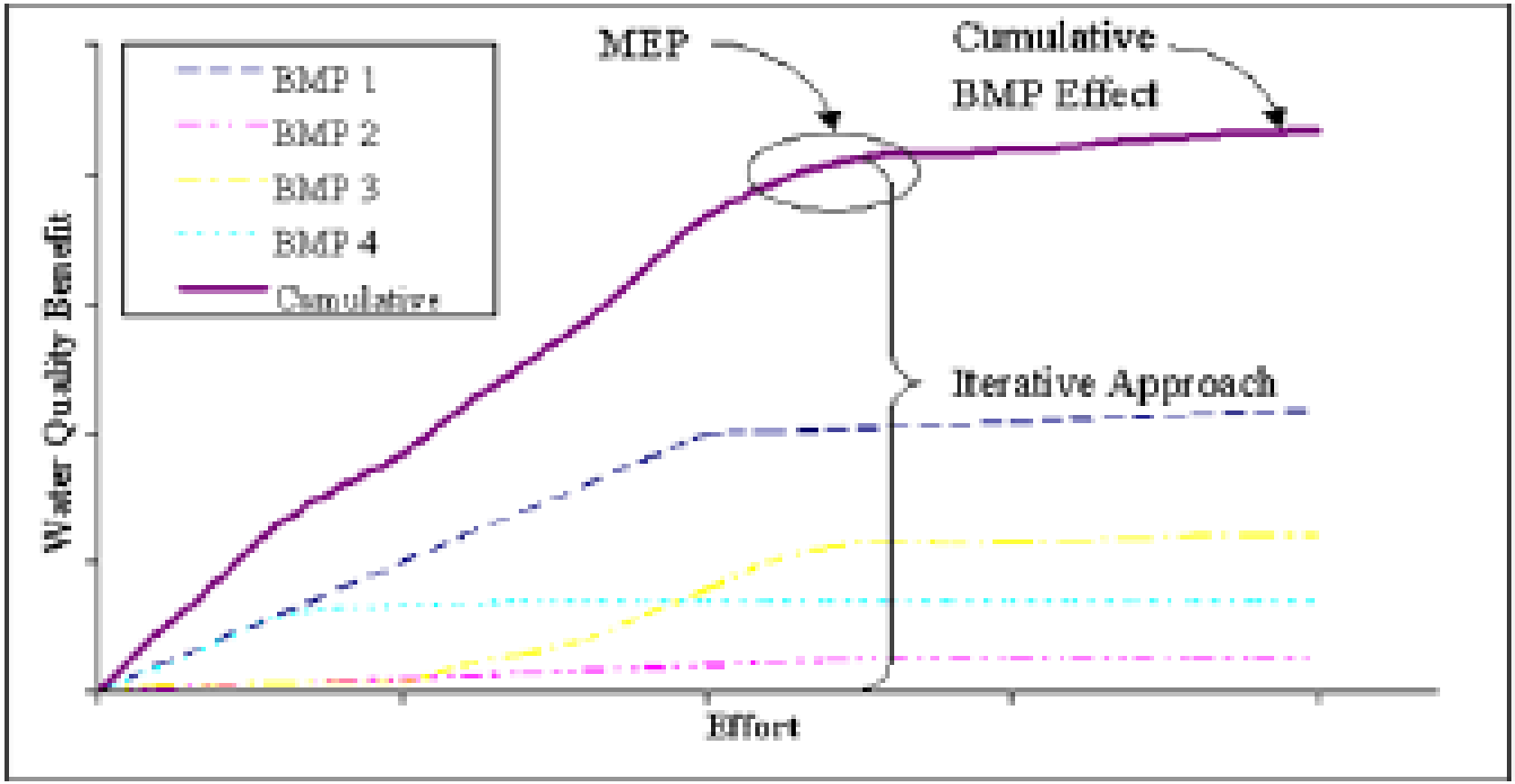
Impervious Cover Control

- Irrigation re-use
- Wet Detention
- Rain Gardens
- Porous Pavements

Bluffton Gateway - Impervious Cover Control

- Consultant submitted analyses for 10%, 14.4%, 15.2%, 19.8%, 24.5% effective impervious area
- Design utilizes these BMPs:
  - Wet Detention Pond
  - Bio-swales / Rain Gardens
  - Runoff capture and reuse for irrigation
  - Porous Pavement
- The range of values was intended to demonstrate Maximum Extent Practicable (MEP)

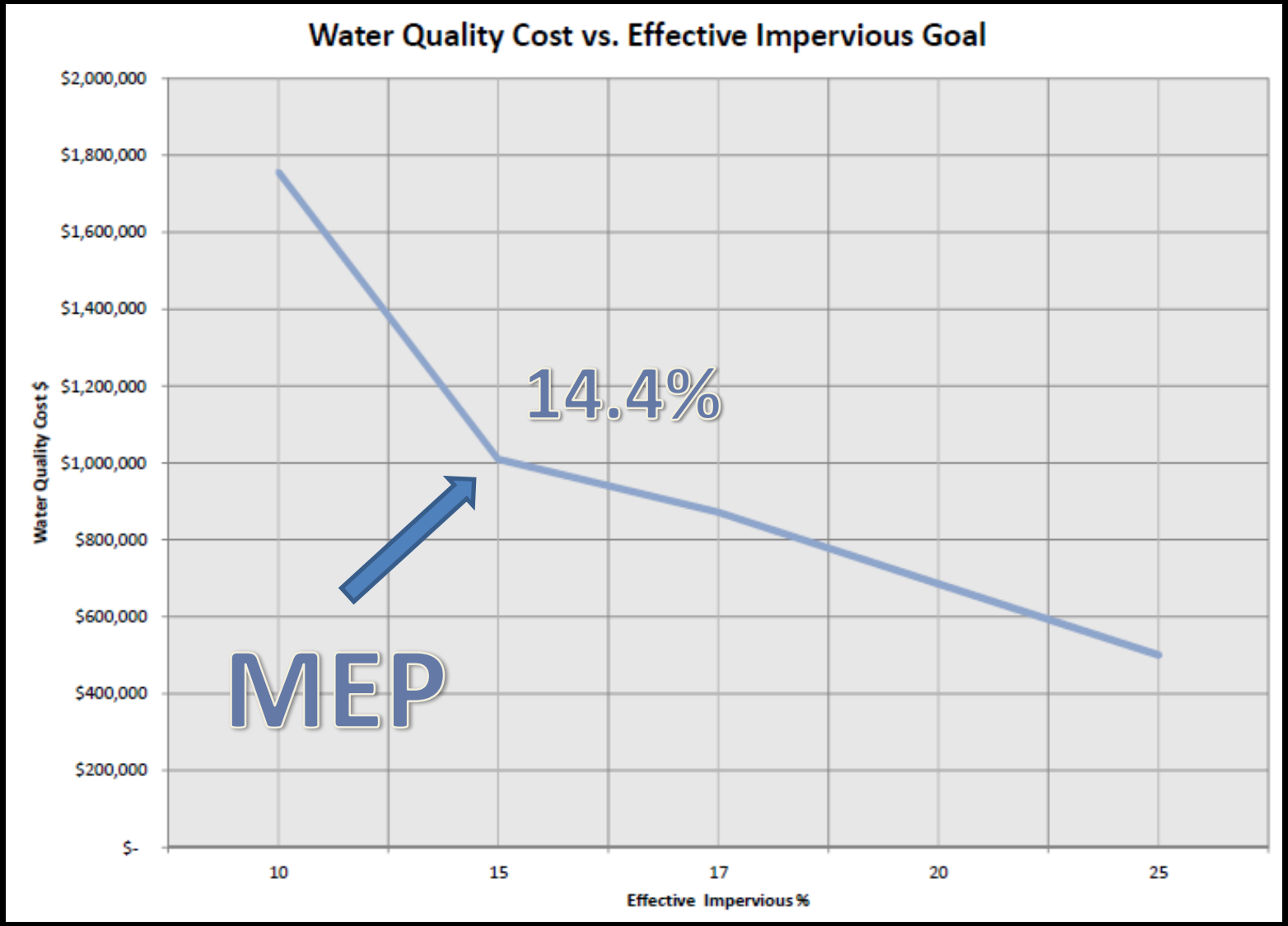
MEP defined



Courtesy of California Water Board

Provided by: SC-DHEC

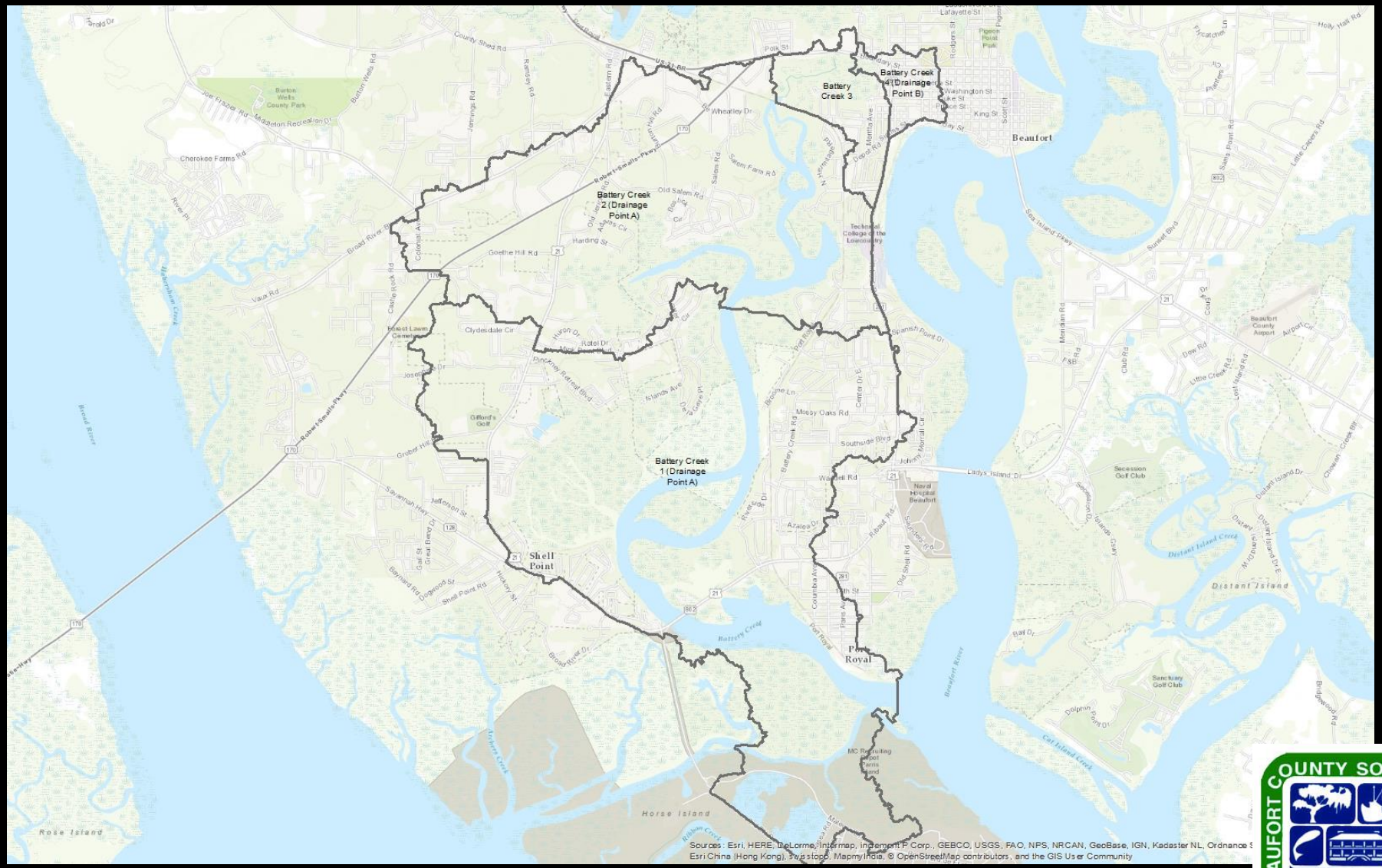
MEP on Bluffton Gateway site



Conclusion

- 4 separate analyses, but
- Impervious Cover Control review has basis as an alternate approach to review the other three main components and applies a performance standard in those three components.
- The BMP Manual DID ALLOW compliance with the three main components yet not meet the Impervious Cover Control approach.
- The “loophole” - Section 5.1 Volume Control – “if post – development impervious surface runoff is equal or less than pre-development pervious surface runoff, then the effective impervious area is 0%.
- 2016 BMP Manual revision closed the loophole. Impervious Cover is now a 4th BMP category.

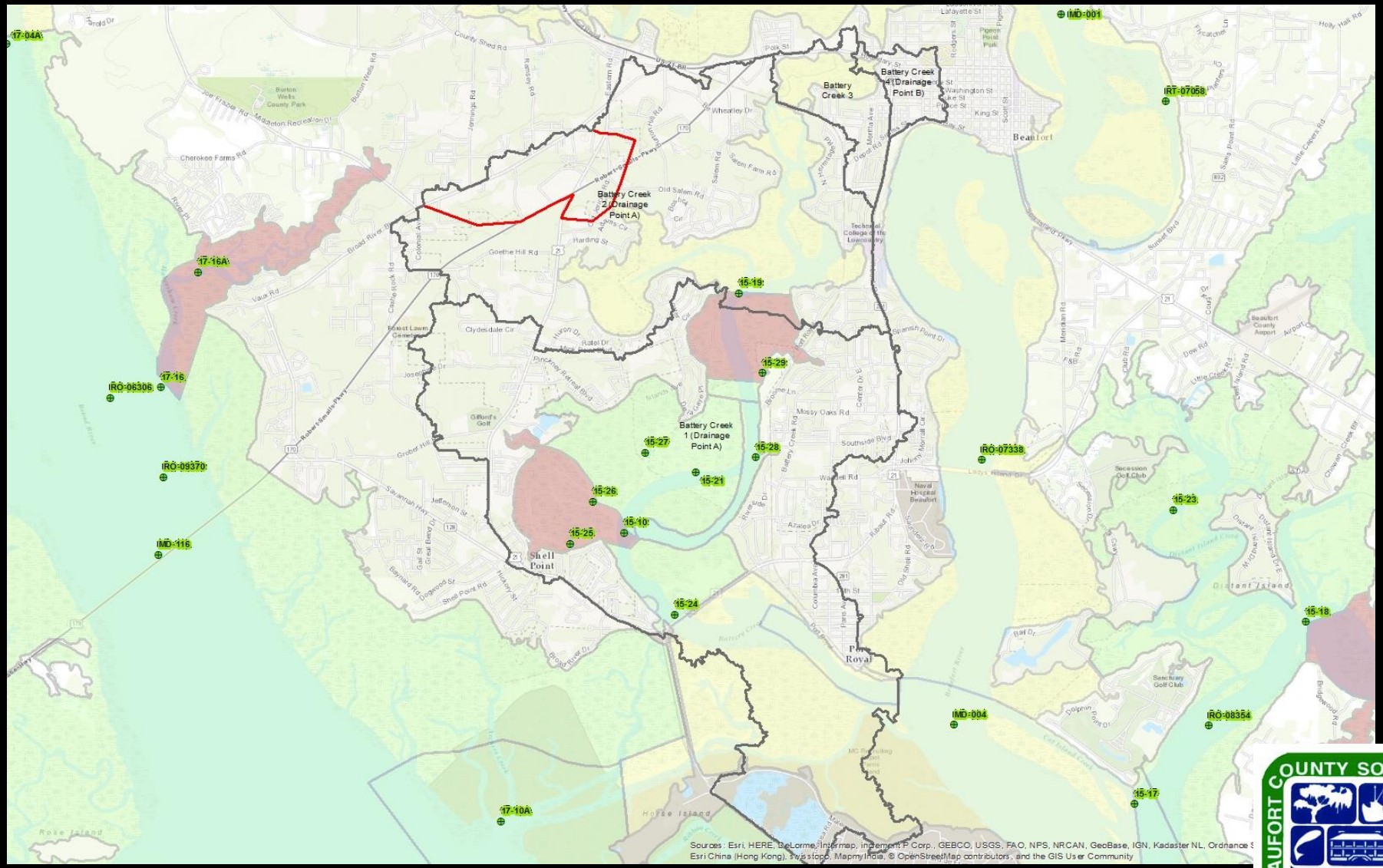
Battery Creek Water Quality Retrofit



Battery Creek Watershed

BEAUFORT COUNTY SOUTH CAROLINA 1769

Battery Creek Water Quality Retrofit



Shellfish Harvesting Closures

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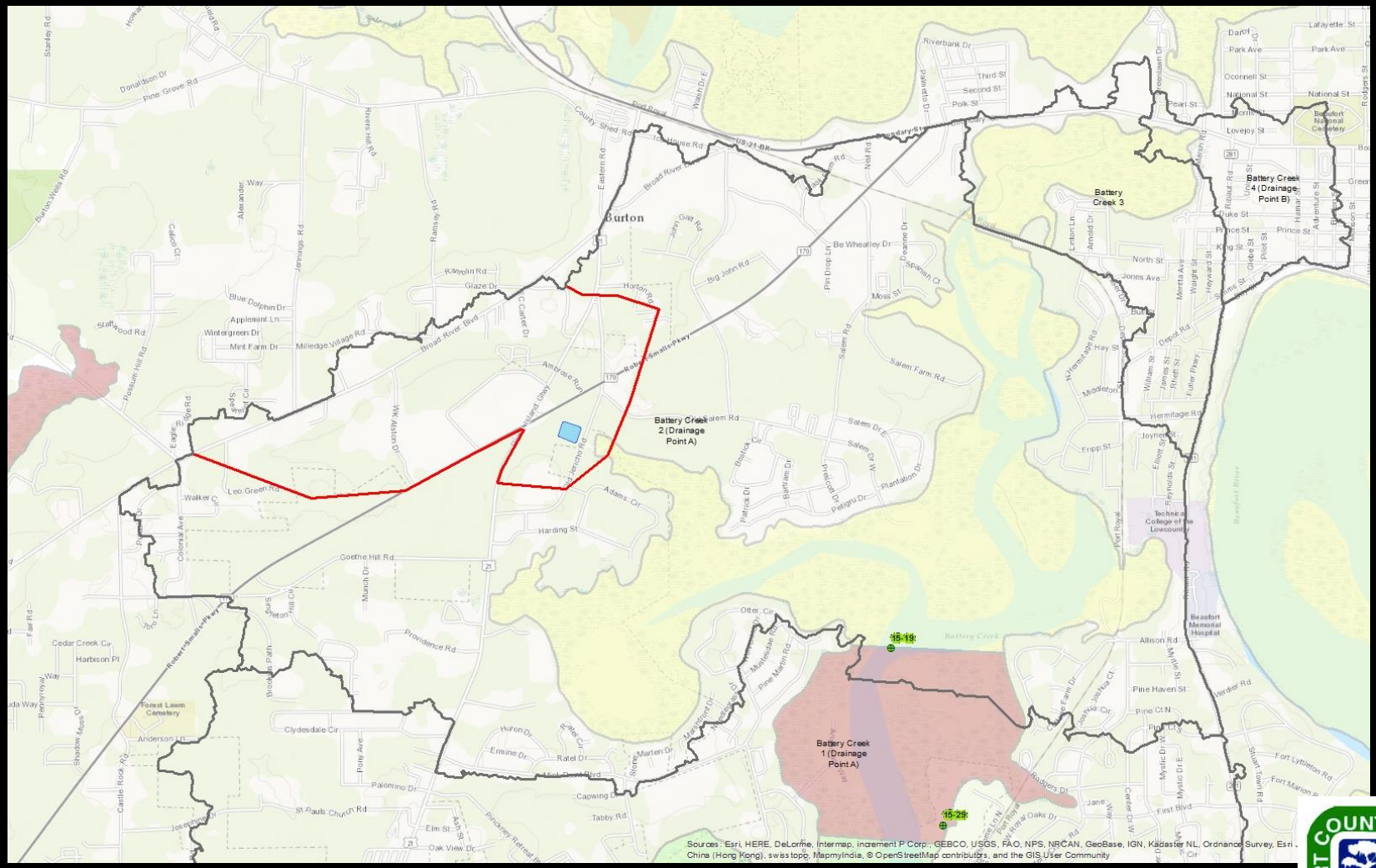
Battery Creek Water Quality Retrofit



Battery Creek Headwaters

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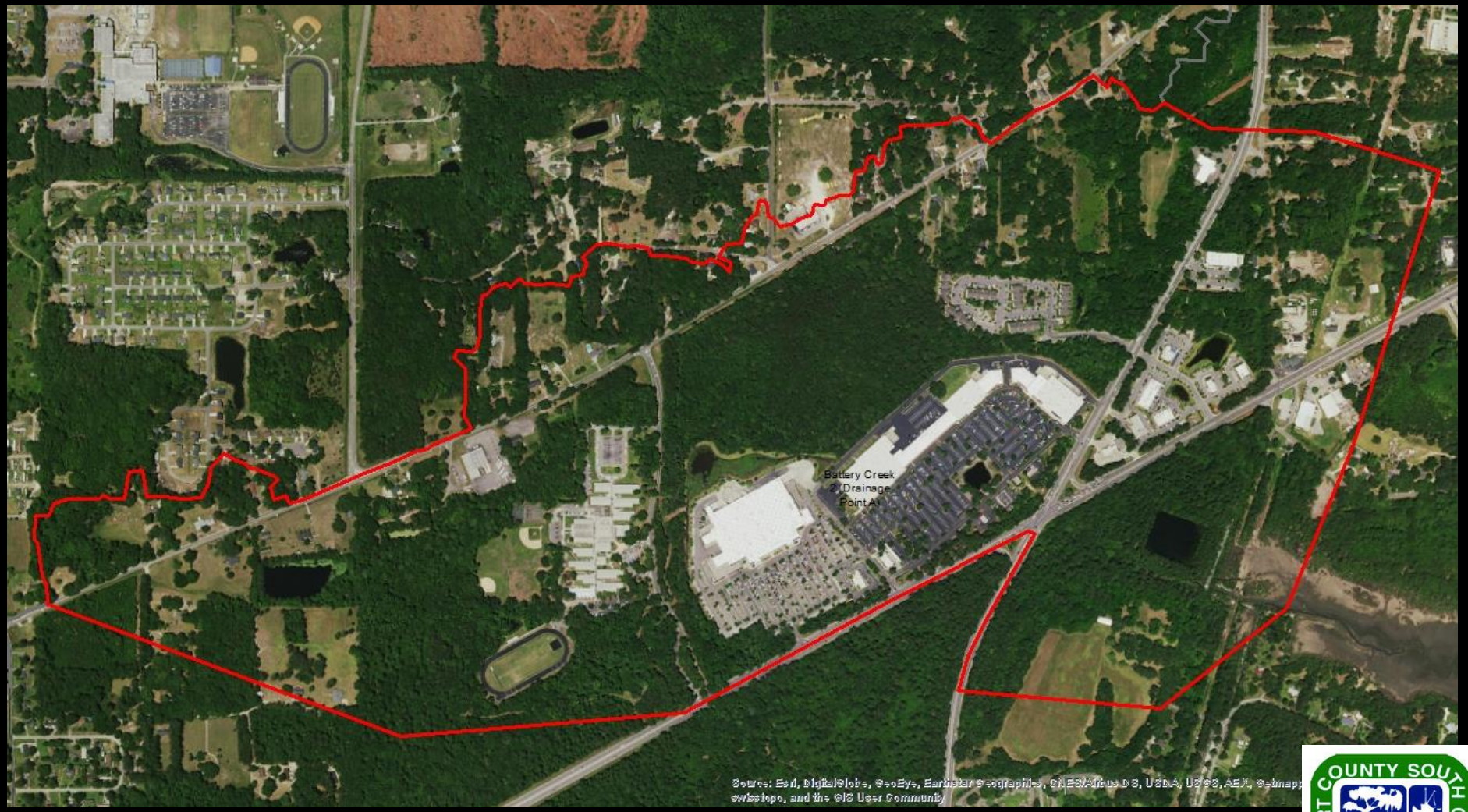
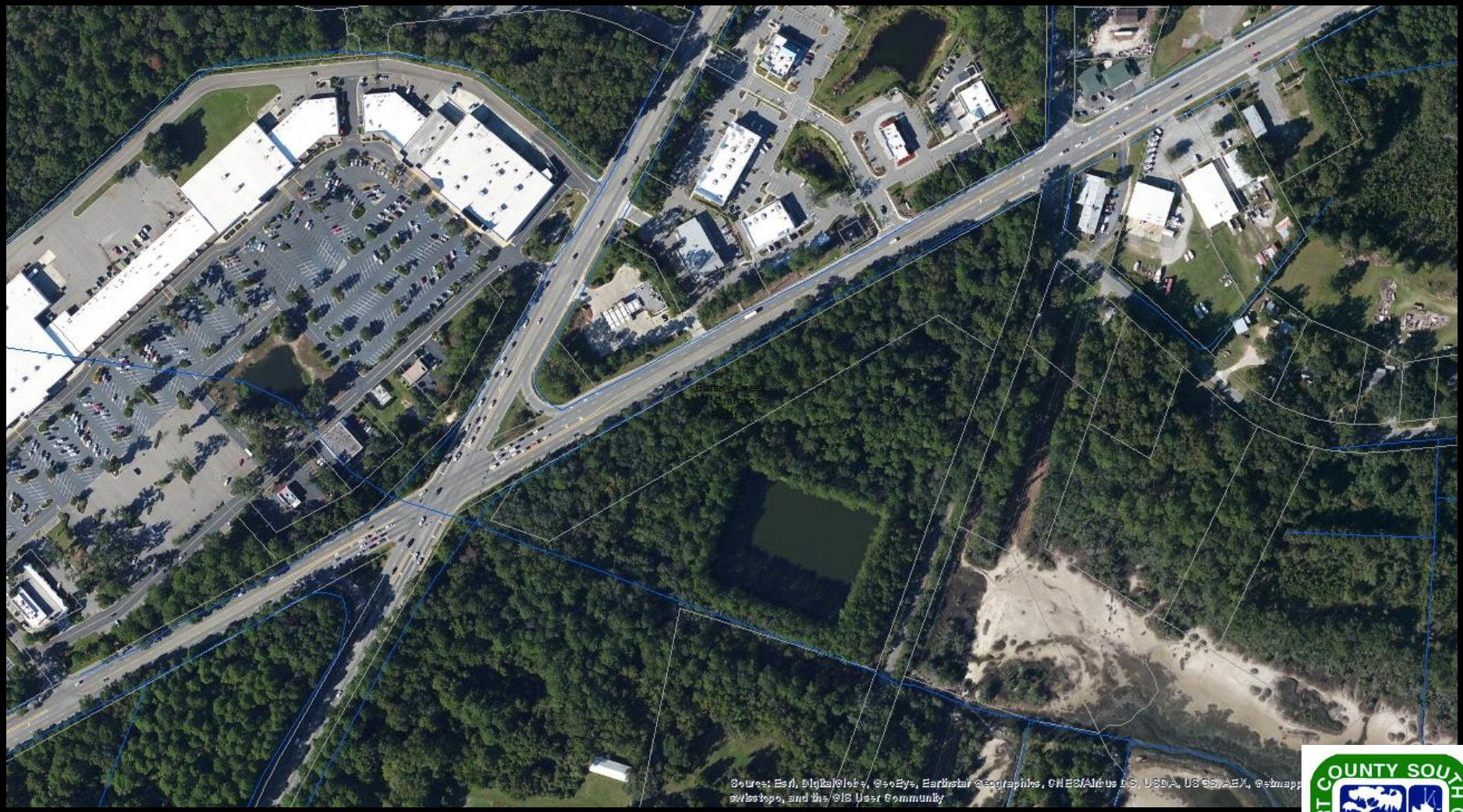
Battery Creek Water Quality Retrofit



Burton Hill Sub-Basin

Battery Creek Water Quality Retrofit



Burton Hill Sub-Basin

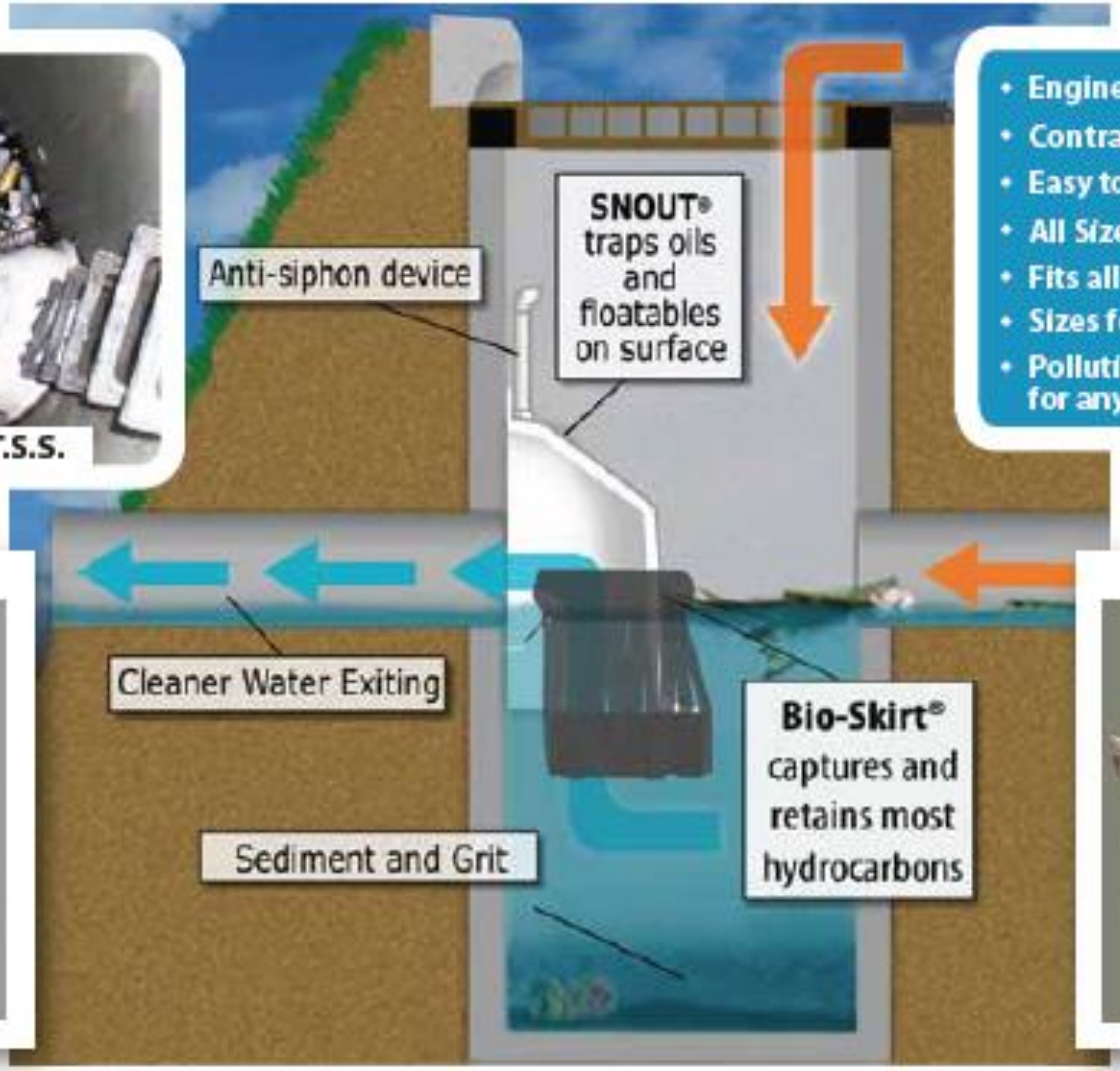
BEAUFORT COUNTY SOUTH CAROLINA 1769

Battery Creek Water Quality Retrofit

BMP Concept

The SNOUT®
+ Bio-Skirt®
+ TrashScreen™

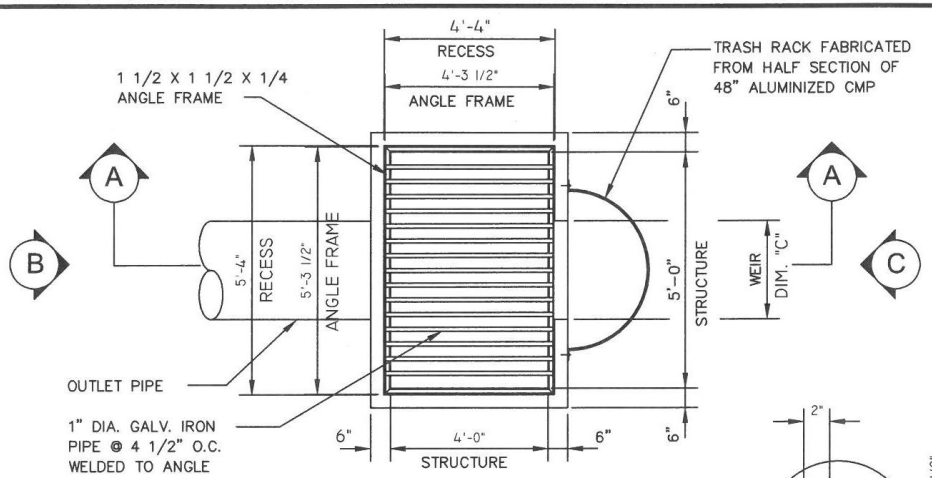
Stormwater Solutions
for Water Quality Improvement and Low Impact Design

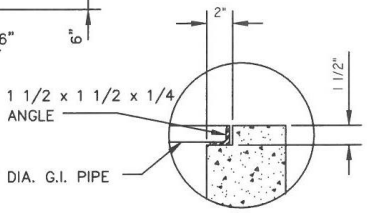


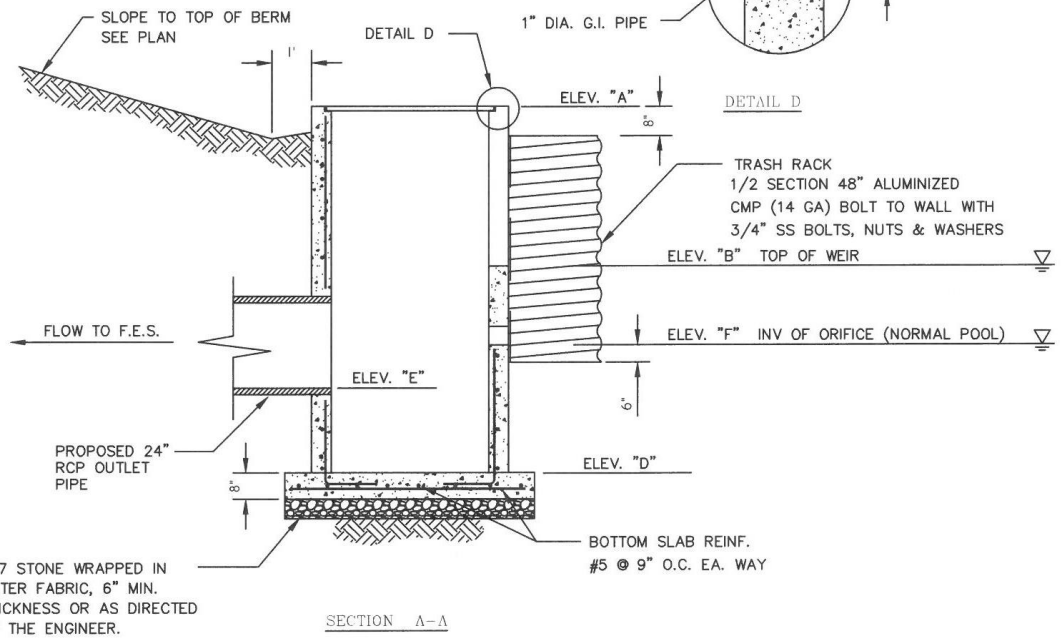
- Engineer Trusted
- Contractor Friendly
- Easy to Install & Maintain
- All Sizes in Stock
- Fits all inlet shapes
- Sizes for up to 72" ID pipes
- Pollution Removal Capability for any sumped structure!

+ TrashScreen

+ Bio-Skirt

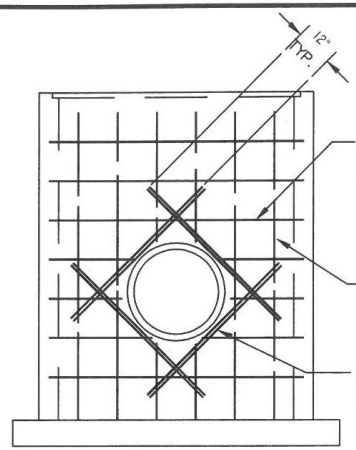




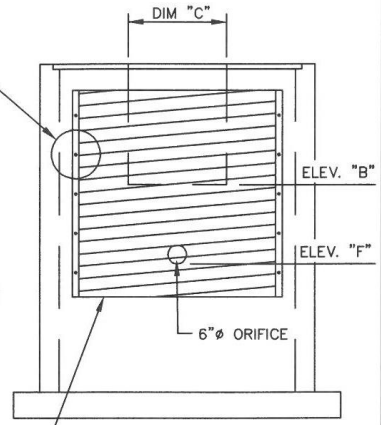


SECTION A–A

DETAIL D



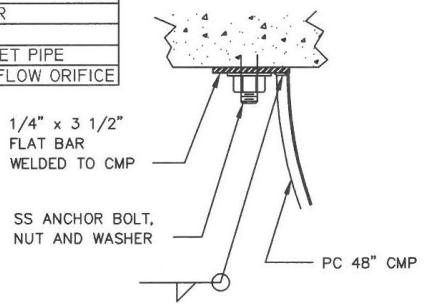
ELEVATION B



ELEVATION C

DIMENSION DATA

ELEV. "A"	7.00'	TOP OF SLAB
ELEV. "B"	5.00'	TOP OF WEIR
DIM. "C"	12.00"	LENGTH OF WEIR
ELEV. "D"	-1.50'	BOTTOM SLAB
ELEV. "E"	1.50'	INVERT OF OUTLET PIPE
ELEV. "F"	3.00'	INVERT OF LOW FLOW ORIFICE



DETAIL E

NOTES:

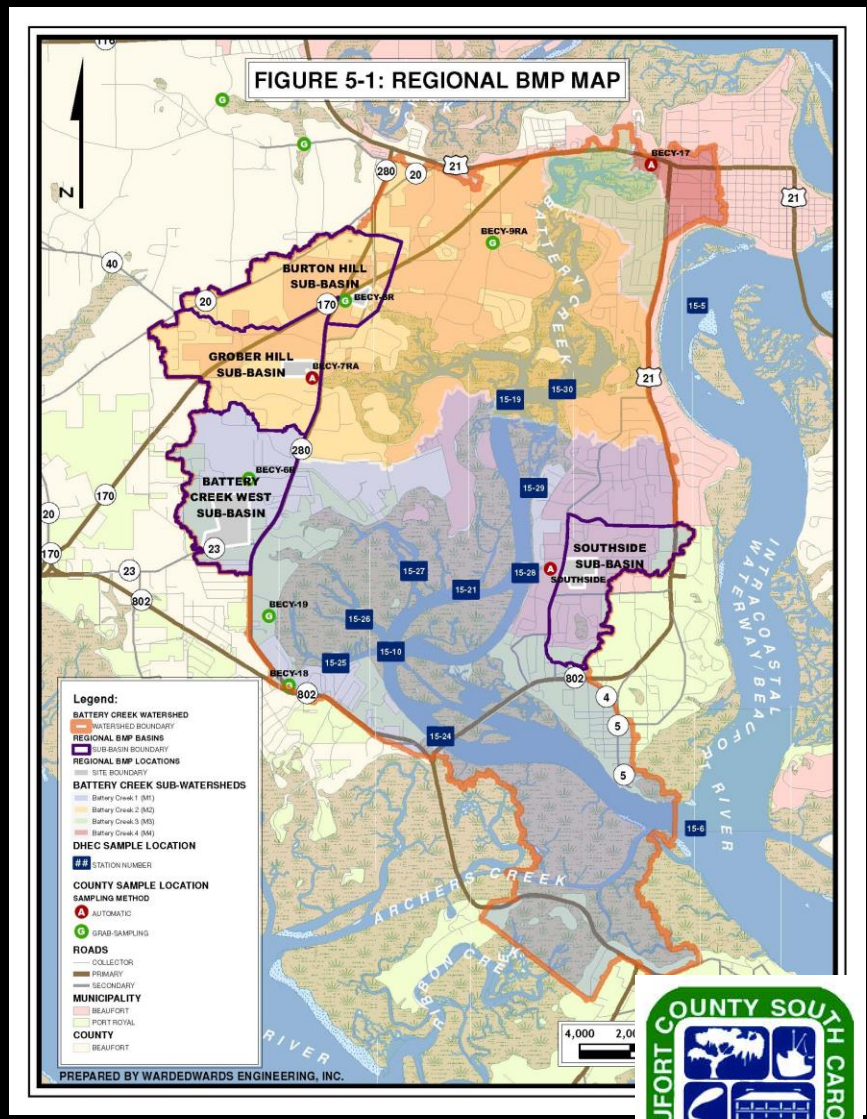
1. ALL CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI.
2. WHERE UNSTABLE FOUNDATION SOILS ARE ENCOUNTERED, EXCAVATE TO DEPTH AS DIRECTED BY THE ENGINEER AND BACK FILL WITH ACCEPTABLE SOIL MATERIAL OR STONE.
3. BOX AND TRASH RACK TO BE PAINTED "CHARLESTON GREEN".

POND OUTLET STRUCTURE

DETAIL 02660-002

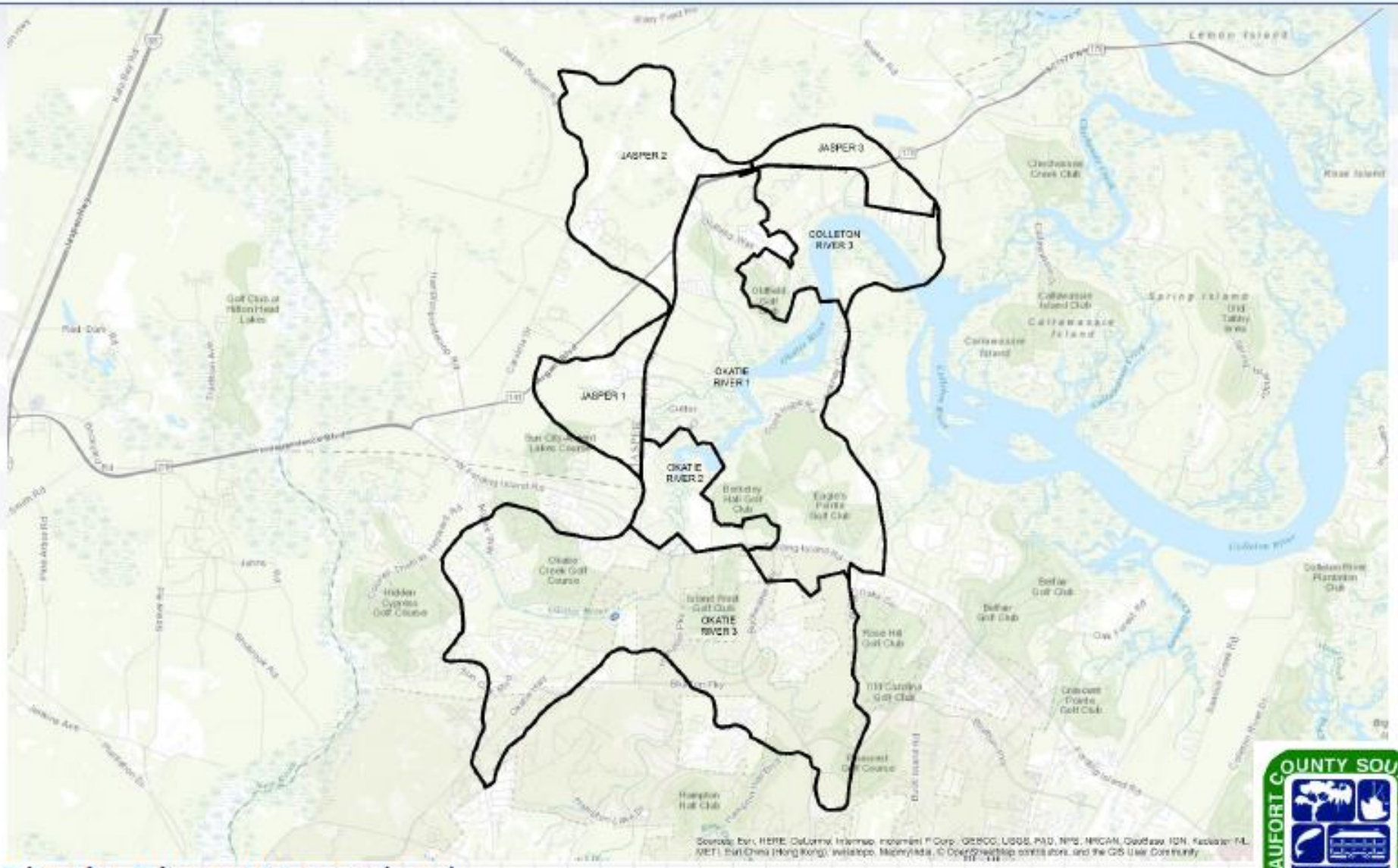
Battery Creek Water Quality Retrofit

- EPA Section 319 Water Quality Grant - $350,000
- Competitive grant administered by SCDHEC based on need and effectiveness.
- Remainder ($400,000) funded by the City/County through the Stormwater Utility Fee.



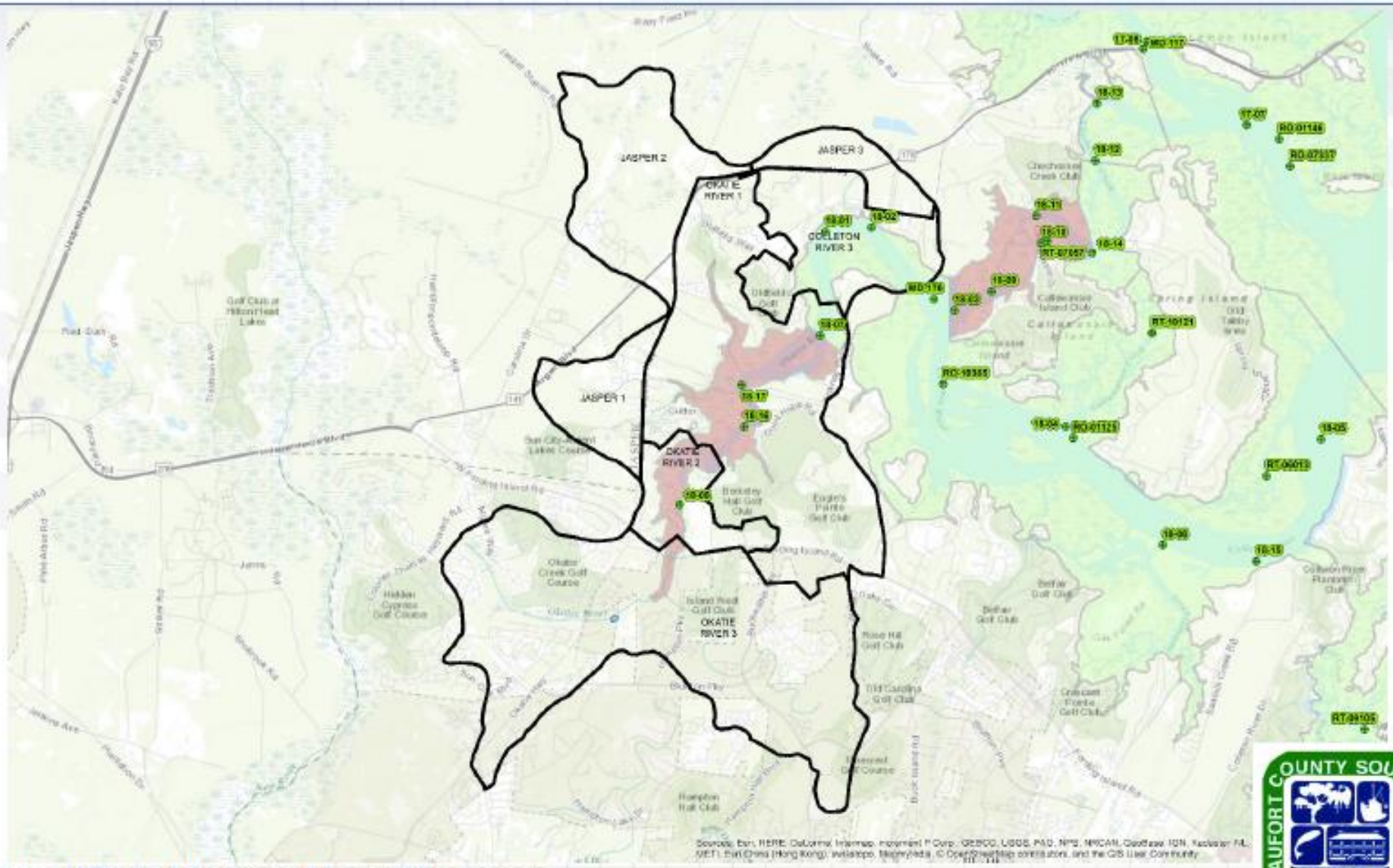
Project Funding

Okatie West Water Quality Retrofit



Okatie River Watershed

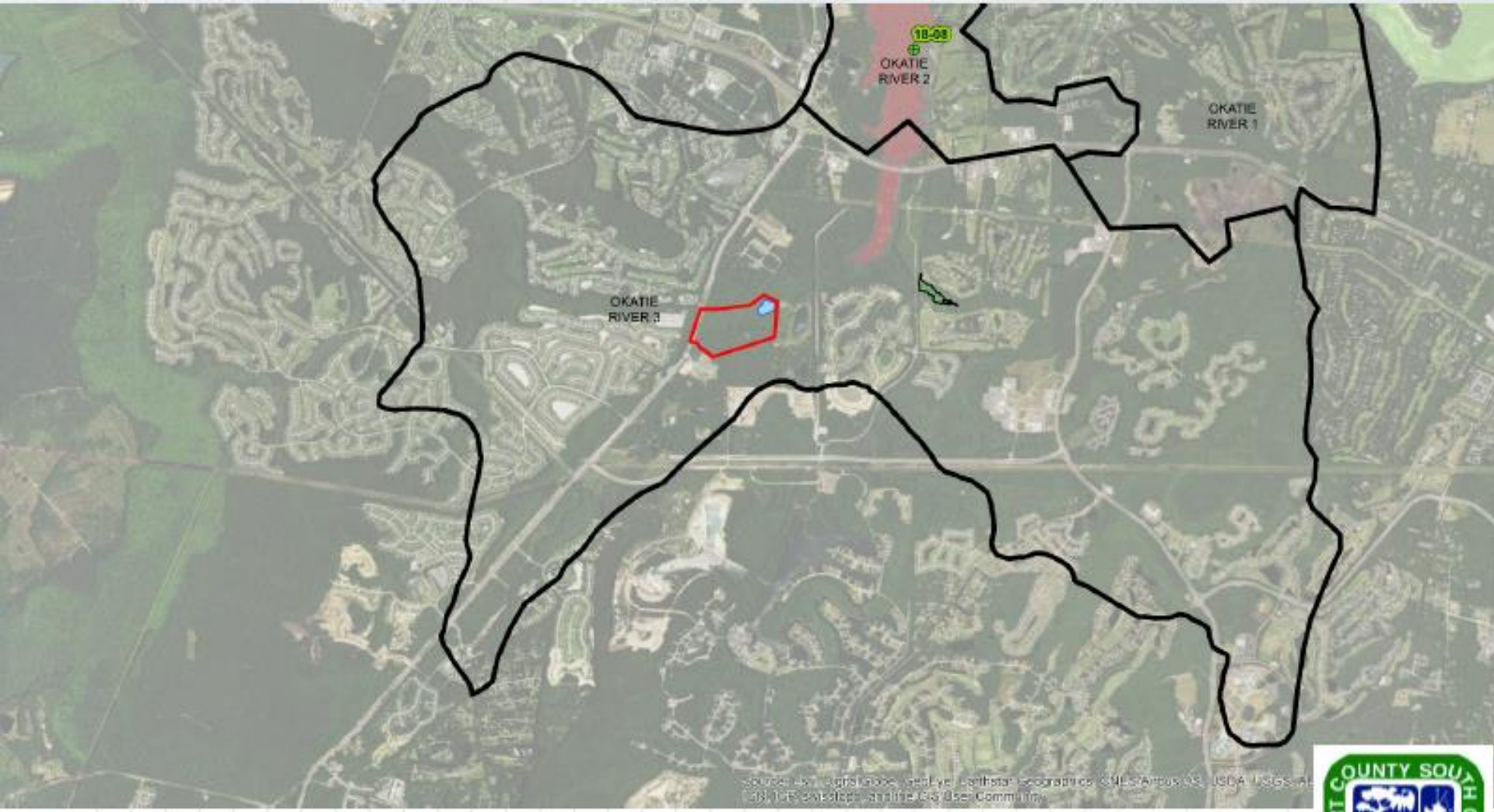
Okatie West Water Quality Retrofit



Shellfish Harvesting Closures

BEAUFORT COUNTY SOUTH CAROLINA 1769

Okatie West Water Quality Retrofit



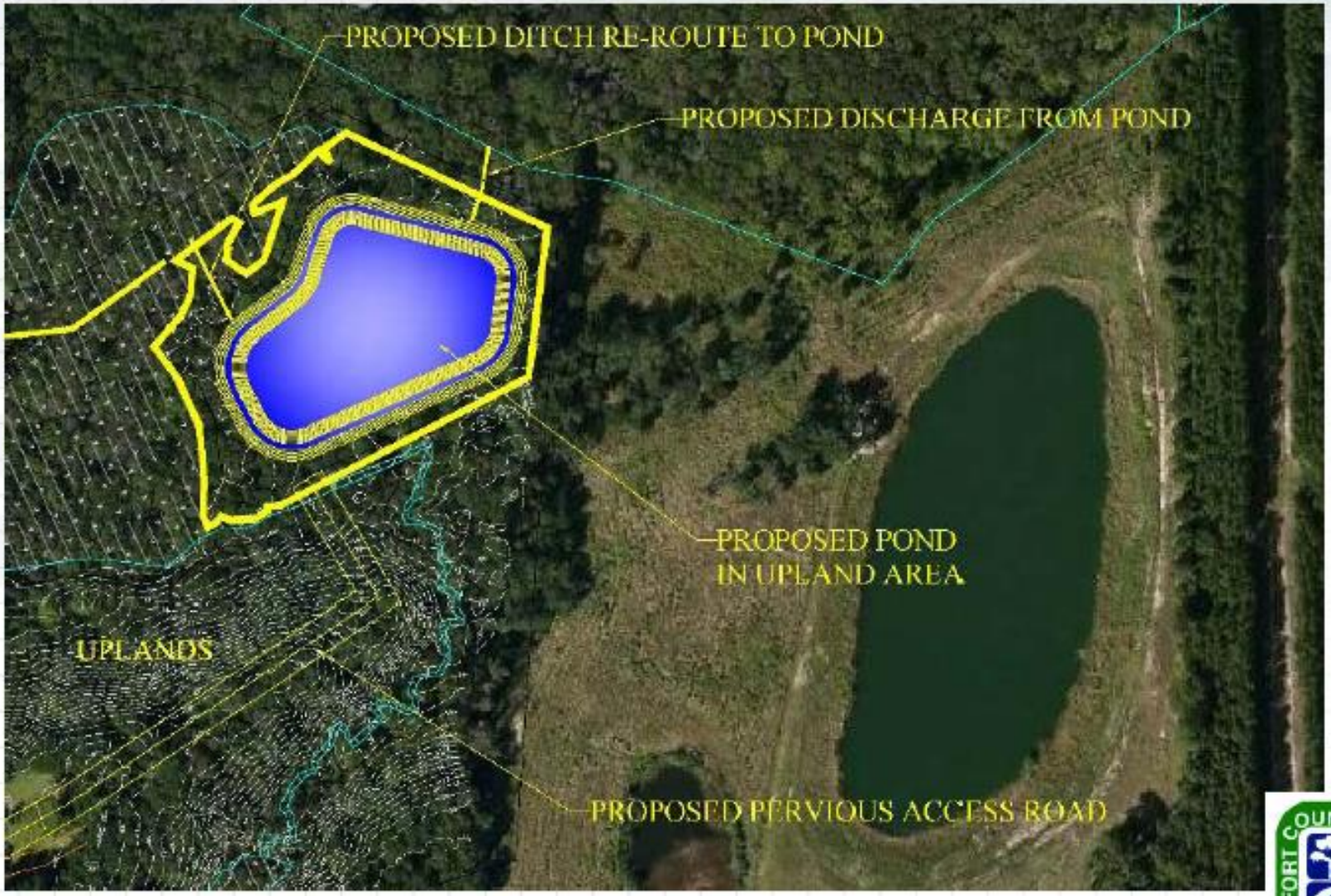
Okatie River Headwaters – East & West Branches

Okatie West Water Quality Retrofit

Okatie West Project Scope

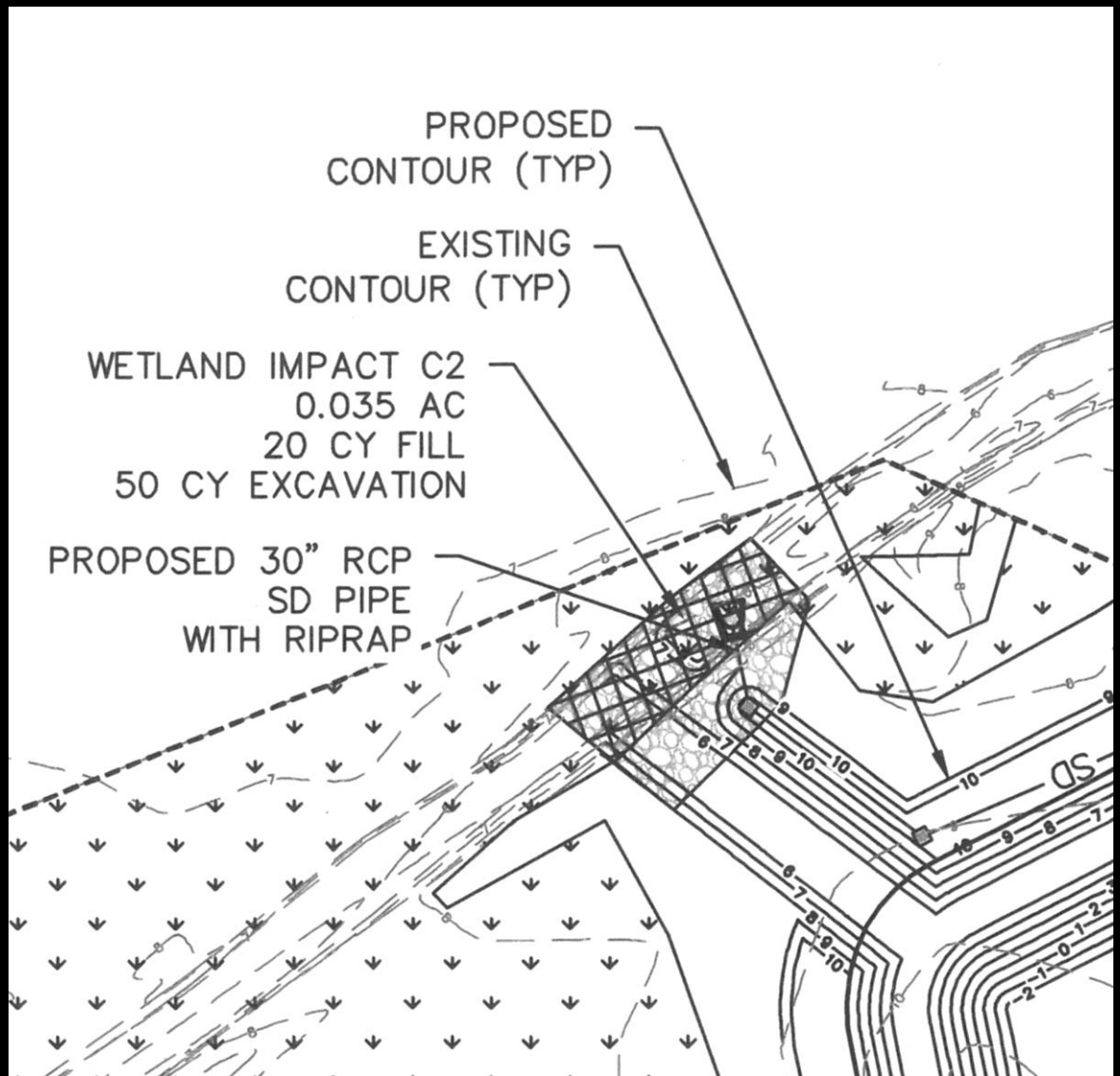
BEAUFORT COUNTY SOUTH CAROLINA 1769

Okatie West Water Quality Retrofit



Okatie West Project Scope

Wetland Impact / Inlet-Outlet



Okatie West Water Quality Retrofit

- EPA Section 319 Water Quality Grant - $792,000
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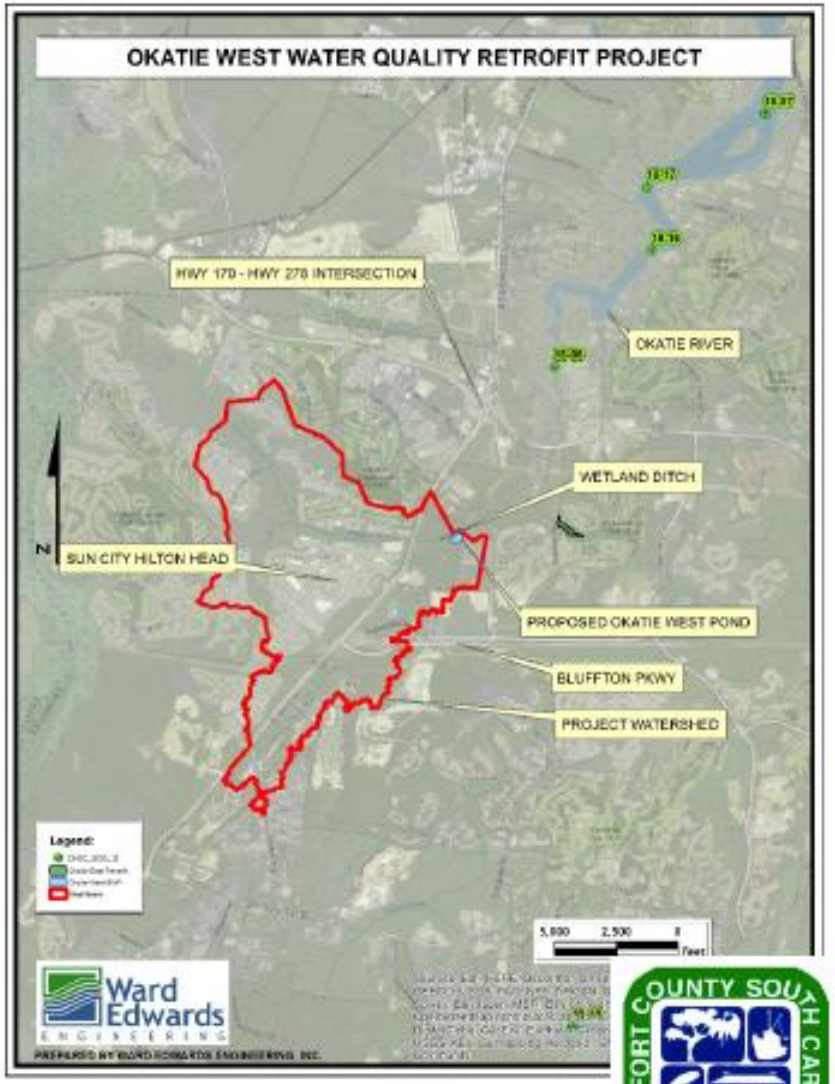
- Remainder ($500,000) funded by the County through the Stormwater Utility Fee.



Project Funding

Questions?

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