February 29, 2024

Dan Rybak
Project Manager
Town of Bluffton
1261 May River Rd
Bluffton, SC 29910

Re: Crooked Cove and Guerrard Cove Inventory/Condition Assessment and Crooked Cove Master Plan Report

Dear Mr. Rybak:

J Bragg Consulting Team "Team" is pleased to present a proposal for professional services associated with stormwater asset inventory/condition assessment of Crooked and Guerrard Cove watersheds and Stormwater Master Plan for the Crooked Cove watershed. It is understood by the Town that the Guerrard Cove H&H analyses and production of the master planning report will be conducted under separate MSA Task Authorization. The master plan for Crooked Cove includes hydrologic and hydraulic (H&H) analysis, flow monitoring and preparation of a master planning report. I have prepared this proposal along with the supporting documents providing the project scope and associated fees. The scope of work consists of:

- Project Management
- Stormwater Infrastructure Inventory and Assessment for Crooked and Guerrard Coves
- Existing Conditions Stormwater System Capacity Analysis (Crooked Cove only)
- Proposed Conditions Stormwater System Capacity Analysis (Crooked Cove only)
- Preparation of Master Planning Report (Crooked Cove only)
- Stormwater Flow Monitoring (Crooked Cove and Guerrard Cove)

The Team understands that the Town of Bluffton "Town" is interested in inventory of stormwater assets, as described in Task 2 and understanding the existing conditions of the of the aforementioned watershed's stormwater management system performance including the existing system capacity and physical conditions. Furthermore, the Town wishes to upgrade these systems through a Capital Improvement Plan (CIP) if found to be deficient, per Town of Bluffton, Beaufort County or SCDOT standards, in capacity based on existing conditions stormwater modeling.

The Team will employ lessons learned during the Heyward Cove Inventory and Master Plan project to provide better efficiency throughout course of this project. Those lessons learned include;

- Use of the Town of Bluffton inventory GIS schema tailored to Cartegraph which, was developed during the Heyward Cove project,
- Use of the Beaufort County stormwater asset GIS inventory which, was not available prior to the beginning of the Heyward Cove project that will provide more accurate inventory asset estimation,
- Cost contingency for inventory asset overruns due to new or previously missed assets when compared to existing inventory data,
- Tailored GIS schema for direct correlation with the PCSWMM model which will streamline PCSWMM model development, and
- An overall understanding of the Town of Bluffton's Master Planning Report requirements.

The Team's proposed tasks, outlined below, include project management, stormwater inventory and condition assessment, data gathering, hydrologic/hydraulic modeling of existing conditions stormwater system capacity, hydrologic/hydraulic modeling of proposed conditions stormwater system capacity and the development of a stormwater master plan. The proposed scope is further described below:

18 Daffodil Farm Way | Bluffton | SC 29910 (803) 513-3777 jbragg@jbraggconsulting.com

Task 1: Project Management

The Team will provide Project Management services for Crooked Cove and Guerrard Cove Inventory/Condition Assessment and Crooked Cove Master Plan Report. Project Management services will include the following:

- Attendance of 7 meetings including the following;
    - Kickoff Meeting
    - Monthly Progress Meetings, 5 assumed
    - Project Delivery Review Meetings, 1 assumed
- Response to project reviews including;
    - Final asset data Review
    - Final Master Plan Report (One review)
- Client and Team communications for the projected 180-day duration, and
- QA/QC of project deliverables.

Deliverables:

- Meeting minutes, and
- Monthly Progress Reports.

Task 2: Stormwater Inventory and Stormwater System Condition Assessment

Tetra Tech will be primarily involved in the inventory and condition assessment of the areas located within the boundaries shown in the attached figure, and within the assumed Crooked Cove & Guerrard Cove watersheds. Tetra Tech will complete the following tasks.

- The stormwater inventory and condition assessment will utilize information provided in the Town of Bluffton's existing GIS stormwater inventory within the watershed's listed above and the Town of Bluffton's limits.
- The inventory will include existing known stormwater features (inlets, pipes, culverts, channels & streams) per existing GIS and will include an inventory of yet unidentified features found during the inventory.
- The asset inventory data collection will include; type, size, owner, material, location elevations and condition assessment. As the inventory is being conducted a stormwater feature condition assessment will be determined and documented for stormwater inlets, pipes, culverts, channels, and streams within the aforementioned area. The system inventory will include only stormwater pipes 12-inches and larger.
- The GIS data provided from the Town and County will be reviewed prior to field inventory and assessment. This will be placed on a secure server and be the basis of our work under this project. Our GIS personnel will conduct an automated error checking process to flag data fields that may be missing from existing data. The point and linear features with missing data will be flagged so our field team knows exactly what information needs to be collected once in the field.
- We will meet with the Town in a virtual meeting to discuss procedures and desired outcomes and coordinate field survey dates which will occur during the project's kickoff meeting. The first component is the survey with high-resolution GPS equipment. The second is inventory attribute data collection and mapping. The third component is the condition assessment. At each stormwater inlet, pipe, culvert, channel or stream, photos will be taken to document current conditions. The Team will also measure down inlets and pipes to confirm depth and pipe diameter. All photos and measurements will be directly attached to the GIS database at the time of inventory to ensure that they cannot be lost or misidentified later.
- Tetra Tech will use a hybrid approach to document pipe connectivity and condition and confirm the current GIS accuracy. In addition to traditional sound-testing and as-built research, a custom pole-mounted camera is used to look down each pipe from the upstream and downstream directions. This process allows for visual inspection of the pipe from each direction. We will track pipe conditions into two categories, pipe structural defects and pipe maintenance defects, as prescribed by NASSCO and other industry guidance. Structural defects pertain to physical defects in the pipe integrity such as cracks or joint offsets. Maintenance defects pertain to pipe issues related to non-structural issues such as sediment buildup and organic debris. Our team will use this data to make recommendations for the condition reports and updates to the pipe network.

Assumptions:

- Town of Bluffton will provide GIS data and highlight essential inventory information that must be collected for each type of stormwater inlet, pipe, culverts, and major channels/streams.
- Drainage system inventory and assessment will include storm drainage infrastructure within the right of way and primary systems on private property.
- Major open channels and blue line stream data will include channel inverts, cross sections every 500-ft (where attainable) condition, photos, and location.
- Town of Bluffton will provide reasonable support, letters of notification, and information to residents where stormwater features are located near private property.
- The basis for the cost estimate was developed from information provided that indicates the following base numbers (without contingency)

Watershed	Conveyance (LF)	Nodes/Structures (#)
Crooked Cove	42,082	48
Guerrard Cove	27,813	75

- Based on a total time on site of three (3) crews of two (2) personnel each for five (5) 10-hour workdays.

Exclusions:

- Roadside ditches, unless part of main watershed conveyance, and driveway pipes.
- Inlets, pipes, and culverts that are found to be inaccessible due to submergence or physical restraints including private property (i.e., restricted access, fences) will be documented. A list of these inaccessible features will be provided to the Town of Bluffton for further maintenance action and upon resolution of the accessibility the J. Bragg Team will return to conduct inventory and condition assessment on the inaccessible structures if so desired by the Town.
- Non-stormwater pipes and stormwater pipes less than 12" are excluded from the inventory and condition assessment.

Deliverables:

- PDF mapping illustration of assets to be distinguished by asset owner.
- Information collected will be provided back to Town of Bluffton in GIS schema initially provided as well as layers compatible with the Cartegraph Asset Management System
- Prioritization list of retrofit projects

Task 3: Data Gathering

The Team will perform a field review to confirm the Crooked Cove watershed boundary, develop manning's friction (n) values and measure cross sections for open channels. Historic records and evidence of flooding or drainage obstructions will be gathered and documented. A desktop level analysis will be performed to gather pertinent data and background information needed to develop a H&H model of study area, to include;

- Data collected during the Heyward Cove Inventory and Master Plan Project,
- NOAA Office for Coastal Management Digital Coast Digital Terrain Model (DTM),
- Data collected from the proposed inventory and condition assessment,
- Heyward Cove tidal gage data,
- Existing South Carolina Department of Transportation (SCDOT) as-built plans, and
- Available permit construction plans for communities, schools and infrastructure located within the watershed.
- Flow data via the J. Bragg supplied flow monitor

Note that any costs associated with acquiring permit construction plans from Beaufort County will be the responsibility of the Town of Bluffton.

Task 4: Existing Conditions Stormwater System Capacity Analysis

The information collected during Task 2 & 3 will be used to develop a 1D/2D PCSWMM hydrologic/hydraulic model for analysis of the existing conditions. This analysis will be conducted to determine both the hydrologic characteristics and dynamic hydraulic performance within the study area. The hydrologic model will be prepared in accordance with the Southern Lowcountry Stormwater Design Manual, which, has been adopted by the Town of Bluffton. Curve Numbers will be developed based on latest land use data sets for the Crooked Cove watershed and United States Department of Agriculture (USDA) Web Soil Survey Hydrologic Soil Group (HSG) ratings.

An existing condition hydraulic model will be prepared using the information listed above in order to better understand the existing conditions of the stormwater management system including areas of inundation, choke points and conveyance capacities and will include the following conditions;

- 10-, 25-, 50- and 100-year design storms,
- Existing conditions of pipes and inlets will be analyzed as designed without respect to actual condition (i.e., sediment accumulation or structural damage),
- Existing conditions of channels, ditches and creeks will be analyzed by adjusting n values to represent actual field conditions,
- Mean High Water (MHW) outfall boundary condition based on historical/recent data from the Heyward Cove tidal gage,
- Resiliency conditions:
    - One (1) Sea Level Rise outfall boundary condition analyses based on the 10, 25, 50 & 100-year design storm events to meet asset owner's stormwater system capacity standards, and
    - Resilient conditions will include subjecting the existing stormwater system model with future projected precipitation/rainfall (NOAA Type B cumulative rainfall distribution) patterns for the 10, 25, 50, & 100-year storm events to an analyze existing stormwater system capacities and watershed inundation due to higher future cumulative rainfall amounts.

Exclusions:

- Roadside ditches unless they are considered part of the watershed main conveyance system, and
- Driveway pipes

Deliverables:

- Updated Mapping including inundation zones in GIS and PDF formats
- Exhibits and summary tables showing results of the PCSWMM existing conditions model (PDF & Tables)

Task 5: Proposed Conditions Stormwater System Capacity Analysis

Upon completion of the existing hydraulic model, areas within the stormwater management system that do not meet the asset owner's capacity standards (SCDOT, Town of Bluffton, & Beaufort County), choke points and retention/detention will be further studied to determine proposed mitigation measures and to develop individual CIP projects based on priorities as described in **Task 2**. The proposed PCSWMM analyses will include;

- 10, 25, 50 & 100-year design storms to be consistent with asset owners' standards for stormwater system capacity,
- retention/detention per the Southern Lowcountry Stormwater Design Manual to meet assets owner's stormwater capacity standards,
- Mean High Water (MHW) outfall boundary condition based on historical/recent data from the Heyward Cove tidal gage,
- Resiliency conditions:
    - One (1) Sea Level Rise outfall boundary condition analyses based on the 10, 25, 50 & 100-year design storm events to meet asset owner's stormwater system capacity standards, and
    - Resilient conditions will include subjecting the proposed stormwater system model with future projected precipitation/rainfall (NOAA Type B cumulative rainfall distribution) patterns for the 10, 25, 50, & 100-year

storm events to analyze the proposed stormwater system capacity and watershed inundation due to higher future cumulative rainfall amounts.

Exclusions:

- Roadside ditches unless ditches are considered part of the watershed main conveyance system, and
- Driveway pipes

Deliverables:

- Updated Mapping of proposed condition inundation zones in GIS and PDF formats
- Exhibits and summary tables showing results of the PCSWMM existing conditions model (PDF & Tables)

Task 6: Preparation of Master Planning Report

Upon completion of the modeling a Master Plan report will be prepared to document the results of the analysis, inventory and condition assessment and include recommendations for CIP project alternatives and planning level cost estimates for the alternatives.

Deliverables:

- Final Stormwater Master Plan report
- Capital Improvements Mapping, priority & cost estimates.
- Result Tables for the following:
    - Road overtopping matrices by event and asset owner
    - Conduit Input and scenario result summaries
    - Node Input and scenario result summaries
    - Asset ownership summary tables
    - Survey comparison tables for data collection methods and digital terrain model (DTM) data
    - Primary Cross-section analysis point tabular results
- PDF Mapping Illustration of Assets and Conditional Assessment including the following:
    - Inventory Asset Maps
    - Ownership Maps
    - General Maintenance Map
    - Structural Maintenance Maps
    - Condition Assessment Recommendations Mapping
- PDF Mapping Illustrations in the report Appendices for model results:
    - Mapping of the 10, 25, 50 & 100-year design storm events from **Tasks 4** and **5** above for inundation of the following scenarios:
        - Existing
        - Proposed
        - Resilient/SLR
    - Risk Depth Maps for 100-year events for the following scenarios:
        - Existing
        - Proposed
        - Resilient/SLR
    - 25-year event primary drainage profiles for existing and proposed conditions
- Other PDF Mapping in the report Appendices include the following:
    - General Mapping (Aerial, Location, Soils, FEMA, Quad)
    - Basin Delineation Maps (Overall and Subbasins)
    - Landuse Mapping
    - Overlay Maps of the following:
        - 100-year existing and proposed inundation
        - 100-year proposed and proposed Resilient/SLR inundation
    - Pinch and Analysis point description Maps
    - Culvert description maps
    - Survey comparison mapping

Project Delivery:

- Packaged project data for transmittal to the Town of Bluffton saved to a storage device including but not limited to the following:
    - Report and Appendices
    - Cartograph shape and raster result files
    - Packaged PCSWMM models with background layers and precipitation data
    - Master Excel conditional assessment spreadsheets for nodes and conduits
    - Comment responses from previous client review
    - Boundary condition Curves
    - File Key document

Task 7: Flow Monitoring

Flow monitoring will be conducted beginning in the Crooked Cove watershed for a 3-month period then flow monitoring will be conducted for an additional 3-month period in the Guerrard Cove watershed in order to more accurately calibrate the PCSWMM models used for the both the Crooked Cove and Guerrard cove H&H analyses. The work associated with this task will include initial installation in Crooked Cove, relocating the monitor to Guerrard Cove and retrieving the J. Bragg Consulting owned flow monitor at the completion of the Guerrard Cove monitoring period.

The monitor will be installed in the following outfall locations;

- Crooked Cove outfall which is located near the intersection of May River Rd and Crooked Cove Rd.
- Guerrard Cove outfall which is located near 1155 May River Rd.

J. Bragg will utilize an In-Situ MACE FloSeries3 - HVFlo XCi doppler in pipe monitor to assess stormwater flows for as long as necessary to provide enough information to properly calibrate the hydraulic model. six (6) months of monitoring, including 3 months for each deployment will be assumed for fee estimate purposes. Work associated with this task also includes downloading, processing, and analyzing flow data and preparation of two (2) separate SCDOT encroachment permits since the monitoring station will be located in the SCDOT right of way during each deployment.

Assumptions:

- J. Bragg will use a company owned monitor,
- Town of Bluffton to provide rainfall information,
- The Town of Bluffton will be charged an equipment usage fee for use of the J. Bragg Consulting owned monitor

Deliverables:

- Flow monitoring data for Crooked and Guerrard Coves
- Diurnal Flow Charts for the monitoring periods for Crooked and Guerrard Coves

The J Bragg Consulting Team proposes to complete the work for Tasks 1-7 presented as Basic Services for a time and materials contract not to exceed as shown below for Total Basic Services. The following table summarizes fees per subconsultants distribution of work. Itemized fee estimates per Task and Project are attached.

Tasks	Consultant	Fee
1, 3, 4, 5, 6	J. Bragg Consulting, Inc	$110,365.00
2	Tetra Tech	$90,597.04
	Total Time and Materials Not to Exceed	**$200,962.04**
Additional Services		
2A*	Tetra Tech	$3,041.28

Note*: Additional services account for asset overages including conveyances and nodes/structures which were not originally inventoried or are a part of new drainage systems that are not included in the current Town of Bluffton and Beaufort County inventories. The contingency for the purpose of this cost proposal is estimated on a per day basis

and includes a 2-person crew conducting an extra 10-hour day of inventory. The fee shown includes labor and lodging/per diem costs. It is estimated that one (1) additional day of inventory may be required to collect the necessary information.

Additional services not included in this proposal are; class A survey, design, permitting, and bidding services.

If additional services are required throughout the project that are presently undefined or are contingent upon outside parties, the Team would propose to complete that work at our hourly rates. No additional services will be performed without written approval from the Town of Bluffton.

We truly appreciate the opportunity to offer these services. Please do not hesitate to call me should you have any questions or wish to further discuss our approach and fee to make the project a success.

Sincerely,
J. Bragg Consulting, Inc.

Scott Hildebrand, PE
Senior Project Manager

Enclosures:
Man-hour and Fee Estimates
Project Map

2/29/2024

j.bragg Consulting, Inc.
18 Daffodil Farm Way | Bluffton | SC 29910
(803) 513-3777

CROOKED COVE STORMWATER MASTER PLAN

Discipline					Principal	Senior Project Manager	Senior Engineer
Rate					$220.00	$185.00	$165.00
Task	Description				Hours		
1	**Project Management**						
	1.1	Meetings (7 Virtual Meetings, Kickoff, 5 Monthly & Report Review)				14	6
	1.2	Progress Reports (5)				10	
	1.3	Sub Consultant & Client Coordination & Communications (includes review responses)			6	72	12
	Total Task 1 Hours				6	96	18
	Total Task 1 Fee				$1,320.00	$17,760.00	$2,970.00
3	**Data Gathering**						
	3.1	Site Visit					16
	3.2	Data Collection and Review					14
	Total Task 3 Hours				0	0	30
	Total Task 3 Fee				$0.00	$0.00	$4,950.00
4	**Existing Conditions Stormwater System Capacity Analysis**						
	4.1	Basin and Catchment Delineation				2	6
	4.2	Hydrological Analysis (CN & TOC development)				2	8
	4.3	Model Development & Hydraulic Analysis				2	65
	4.4	Calibration and Validation				2	20
	4.5	Deliverables (Inundation Maps & Summary Tables)				4	14
	Total Task 4 Hours				0	12	113
	Total Task 4 Fee				$0.00	$2,220.00	$18,645.00
5	**Proposed Conditions Stormwater System Capacity Analysis**						
	5.1	Proposed Stormwater System Capacity Analysis (10,25, 50 & 100-year Events)				2	15
	5.2	Proposed Retention/Detention and design to meet capacity standards				2	24
	5.3	Proposed Stormwater System Capacity Sea Level Rise Analysis (10,25, 50 & 100-year Events)				2	15
	5.4	Deliverables (Inundation Maps, System Profiles & Tables)				4	18
	Total Task 5 Hours				0	10	72
	Total Task 5 Fee				$0.00	$1,850.00	$11,880.00
6	**Crooked Cove Master Plan Report**						
	6.1	Master Plan Report			2	6	52
	6.2	Appendices Maps, Table Figures			2	6	84
	6.3	Master Plan Report Revisions per Review Comments (includes 1 reviews)			2	6	16
	Total Task 6 Hours				6	18	152
	Total Task 6 Fee				$1,320.00	$3,330.00	$25,080.00
	Crooked Cove and Guerrad Cove Flow Monitoring						
7	7.1	Deployment of Monitoring Station (2 deployments Crooked Cove & Guerrard Cove)				20	
	7.2	Retrieval of Monitoring Station (upon completion of Guerrard Cove monitoring period)				6	
	7.3	SCDOT Encroachment Permit (2 permits Crooked Cove and Guerrard Cove)					16
	7.4	Data Download and Processing (6 Month Period, 3 Mo. Crooked Cove and 3 Mo. Guerrard Cove)					36
	Total Task 7 Hours				0	26	52
	Total Task 7 Fee				$0.00	$4,810.00	$8,580.00
	Total Man-hours				12	162	437
	Total Fee				$2,640.00	$29,970.00	$72,105.00
				Total Man-hours			**611**
				Subtotal			**$104,715.00**
				Equipment Charge($600.00 per Month, (6) Month Period)			**$3,600.00**
				Mileage, Hotel, & Meals			**$2,050.00**
				Total Cost Plus not to Exceed			**$110,365.00**

2/20/2024

CROOKED GUERRARD COVE INVENTORY

Subtask Description	Subtask Details	Personnel	TT Project Manager	GIS Data Analyst	Field Crew Leader	Field Crew	Travel	Total Man Hours
		Rate	$185	$128	$128	$125	NA	
		Duration	Hours					
Kick Off Meeting		**2**	1	2	1			**4**
Request/Obtain Data		**14**	1	4				**5**
Review Town/County Data		**14**	6	16	8			**30**
Crooked Cove and Guerrard Cove	**Total Duration**	**51**						0
	a. Crooked Cove Field Inventory	3	8	8	30	150		196
	b. Guerrard Cove Field Inventory	2	8	8	20	100		136
	c. Travel Hours to/from Bluffton	2			16	80		96
	d. QA/QC	20		90				90
	e. Convert to Cartegraph	5	16	16				32
	f. Deliver GIS data for model creation	19	4	24				28
	g. Travel (lodging, per diem, rental car)	NA					$10,103	0
		Subtotal	$8,140	$21,504	$9,600	$41,250	$10,103	
		Total					**$90,597.04**	**617**

	Rate	# of resources	# of days	Total Cost
Lodging	$ 122.00	6	6	$ 4,392.00
Loding Tax	12%	6	6	$ 527.04
Per Diem	$ 69.00	6	6	$ 2,484.00
Rental Vehicles + Fuel	$ 100.00	3	7	$ 2,100.00
Misc.	$ 100.00	6	1	$ 600.00
Total				$ 10,103.04
Number of field personnel		6		

	Crew Lead	Field Crew	
Crooked Cove (3 days), includes time traveling from home to Bluffton	$4,864	$23,750	$28,614
Guerrard Cove (2 days), includes time traveling from Bluffton back home	$3,584	$17,500	$21,084

Contingency Fee for Additional Work				
	Crew Lead	Field Crew	Travel	Cost per Day
One Team Daily Rate Including Travel Cost	$1,280	$1,250	$ 511.28	**$ 3,041.28**

Crooked Cove

Gerrard Cove

600 0 600 1,200 1,800 ft

Scale 1" = 600-ft

Crooked & Guerrard Cove Location Map

Cove Basins
- Crooked Cove
- Gerrard Cove
- Outfalls
- Flow Monitoring Stations

Conveyance Systems
- Pipe
- Channel/Ditch
- County Node Inventory
- Town Node Inventory