



January 29, 2021

Mr. John Apple
Assistant Town Manager
Town of Bethany Beach, DE

REFERENCE: Bethany Beach Loop Canal Flood Study
McCormick Taylor, Inc.

McCormick Taylor, Inc. is pleased to present the task and price proposal to the Town of Bethany Beach to complete the Bethany Bethany Beach Loop Canal Flood Study. We fully understand the required services associated with the task assignment and are committed to successfully completing the study on time, on budget and to the complete satisfaction of the Town of Bethany. We are excited to present the Town with a team that we believe to be uniquely qualified and experienced in providing the the 2 dimensional modeling services for the above referenced task.

Amy Hribar, PE, CFM will serve as our Project Manager and the primary point of contact. McCormick Taylor has a local office in Salisbury, MD, and will be led by our Baltimore, MD office. We appreciate the opportunity to submit this proposal for the task assignment.

Should you have any questions after reviewing our submission, we encourage you to contact Ms. Hribar at alhribar@mccormicktaylor.com or 410.662.7400.

Sincerely,
McCORMICK TAYLOR, INC.

A handwritten signature in black ink that reads "Amy L. Hribar".

Amy L. Hribar
Senior Manager, Water Resources

Scope of Services

Bethany Beach Loop Canal Flood Study

1.0 Site Overview

This scope outlines the evaluation of flood protection measures within the Town of Bethany Beach, DE, specifically using 2-dimensional hydraulic modeling to assess water surface elevation changes in the vicinity of the potential improvements. The town of Bethany Beach is frequently affected by nuisance flooding due to its relatively low elevation as well as tidal influences on the stormdrain networks and canals. Flooding in Bethany Beach can make it difficult for residents to leave their homes or navigate the streets, cause businesses to remain closed for multiple days, cause damage to motor vehicles and property, and involve significant effort by police, emergency management personnel, and clean-up crews. This study will include performing a detailed hydraulic analysis to evaluate the baseline flooding conditions utilizing an enhanced 2-dimensional model. In addition, the study will evaluate the effectiveness of the preferred option of installing an inflatable dam across the downstream end of the Loop Canal, in conjunction with tidal gates at the structure under Fred Hudson Road. The effects of the proposed improvements on the Ocean View and Cotton Patch Hills communities will be analyzed to assess the local impacts of the design.

McCormick Taylor (MT) will compile and review existing information provided by the Town of Bethany including data from the Army Corps of Engineers (USACE). An initial field review will be completed to observe important features to be included in the hydraulic model and verify the modeling parameters used in the previous study. Photographs will be collected within the project limits and at special interest points.

2.0 Hydrologic Analysis

MT will develop hydrologic models for the drainage areas for the Bethany Loop Canal, incorporating both tidal and riverine flow conditions, as well as tidal conditions for the Assawoman Canal and Indian River Bay tributary north of Fred Hudson Road. Models will be developed for the existing and proposed condition 1 yr, 2 yr, and 5 yr storm events as well as the 'king tide' flooding event. Tidal parameters will be collected from gauge data. Riverine conditions will be determined using NOAA Atlas 14 precipitation depths and frequency with other TR-55 parameters determined using available mapping data, survey provided by the Town of Bethany, and LiDAR-based topography. The drainage area will be sub-divided as needed to model the total peak flows to the Loop Canal. Inflow hydrographs will be developed for input into the 2-dimensional HEC-RAS model. Additionally, the salt pond will be evaluated for its storage capacity and incorporated into the overall hydrologic analysis. This data will be obtained from previous flood models in the study area, and verified by MT. Hydrologic computations and data will be provided in the report referenced below.

3.0 Hydraulic Analysis

MT will develop hydraulic models for the existing and proposed condition iterations through the project study area noted above using HEC-RAS 2-dimensional modeling. MT will utilize available GIS landcover data and a combination of bathymetry, survey, and LiDAR terrain data for the model. Roughness coefficients will be assigned based on field-

verified landcover data, which will be applied over the terrain. A 2D flow area will be applied over the available terrain data, which will allow for multi-directional flow to be simulated by the model. Existing structures will be incorporated into the model using sizing and invert information included within the survey data provided by the Town of Bethany Beach or determined through the review of previous flood models in the study area. This information will be field-verified where feasible. The model will be calibrated as necessary based on tidal flood depth data provided by the Town of Bethany Beach through their available tide gauges.

The existing conditions hydraulic analysis will include modeling flow through the Assawoman Canal, the Loop Canal, the Salt Pond and the Fresh Pond, including the Fred Hudson structure crossing. The proposed conditions hydraulic analysis will incorporate all aspects of the existing model as well as the proposed installation of two actuated tidal structures: an inflatable dam in the Loop Canal at its confluence with the Assawoman Canal, and a tidal gate across the Fred Hudson Road structure. Results will be analyzed in order to determine the effectiveness of the actuated tidal structures, as well as their impact on the neighboring communities. The results of the models will be formatted into a final report which will be submitted to the Town of Bethany upon completion of the study. It is anticipated that MT will respond to two rounds of comments provided by the Town of Bethany Beach and coordinate with the USACE to solicit feedback on the study results.

MT anticipates completing four existing and proposed HEC-RAS scenarios for this study including the 1, 2, and 5-year storms and the 'king tide' flood event (eight model runs total).

MT will prepare a comprehensive report that will document the hydrologic and hydraulic models, inputs, analysis, and results including all back-up calculations. Report exhibits shall include drainage area mapping, floodplain mapping, and a summary of input data for the HEC-RAS 2-dimensional model. Results of each of the flood models will be summarized and compared for use by the Town of Bethany in determining the most effective design option for flood mitigation.

4.0 Project Meetings and Coordination

MT anticipates attending four virtual meetings to review modeling results the Town of Bethany, and Army Corps of Engineers. Additional coordination time is included for interaction with various stakeholders and data gathering purposes.



Proposal Summary

Bethany Loop Canal Flood Study

Job No. TBD

Proposal Summary	
Bethany Loop Canal Flood Study	
Job No. TBD	
Billing Rate Total	\$ 87,962.00 (a)
Direct Costs Other Than Payroll	145.60 (b)
Direct Costs of Services and Work Performed by Others:	
0	-
0	-
0	-
	- (c)
Subtotal (a)+(b)+(c)	88,107.60 (d)
Total Cost	\$ 88,107.60 (f)
Total Estimated Man-Hours:	McCormick Taylor, Inc. 554
	Subs:
	0 -
	0 -
	0 -
Total 554	
Engineer's Name:	McCormick Taylor, Inc. 509 South Exeter Street 4th Floor Baltimore, MD 21202
Fed. I. D. No.:	23-1683759
Contact Person:	Amy Hribar Project Manager 410-662-7400
Prepared By:	Amy Hribar



Name: Bethany Loop Canal Flood Study

Job #: TBD
 Date: January 28, 2021
 By: Amy Hribar

TASK	Hours				Total Hours	Total Dollars
	Director	Senior Manager	Project Manager	Engineer II		
	\$ 300	\$ 232	\$ 145	\$ 115		
I. Site Overview						
1 Review Existing Models, Reports, and Data for accuracy and completeness		6	16		22	3,712.00
2 Complete Site Verification and Field Review		10	10		20	3,770.00
II. Hydrologic Analysis						
1 Evaluate existing ponds within watershed for effects of storage and attenuation (1 pond recognized).		2	6		8	1,334.00
2 Develop hydrology for Town of Bethany. For the existing and ultimate conditions for the 1, 2, and 5-year storm		4	8	24	36	4,848.00
3 Calibrate hydrology to incorporate riverine and tidal flow data	2	6	16	8	32	5,232.00
III. Hydraulic Analysis						
1 Develop existing conditions hydraulic model utilizing existing land use conditions for the 1, 2, and 5-year storm		16	80	28	124	18,532.00
2 Calibrate model to anecdotal information provided by Town of Bethany		2	12	8	22	3,124.00
3 Develop hydraulic models for the three (3) proposed scenarios.		10	60	28	98	14,240.00
4 Prepare Draft Flood Study Report	4	12	30	32	78	12,014.00
5 Address two rounds of comments		6	24	12	42	6,252.00
6 Prepare Final Comprehensive Flood Study Report	4	6	8	8	26	4,672.00
IV. Project Meetings and Coordination						
1 4 Anticipated Review Meetings	8	8	8		24	5,416.00
2 General Coordination	6	8	8		22	4,816.00
TOTAL	24	96	286	148	554	\$ 87,962.00