



TASK 10 INTRODUCTION

Moffatt & Nichol (M&N) is pleased to present this scope of work and fee estimate for services needed to progress the Town's Multi-Decadal Master Plan from the completion of its Year 1 services (under a prior task order) through additional field investigations, engineering, and modeling needed to progress the engineering side of the Master Plan.

The environmental documentation and agency/public coordination process to begin to pursue programmatic environmental approvals for implementing the plan is not included in this scope of work. The environmental consulting service are left out of this scope of work in order to align this scope and fee with the Town's available resources at the beginning of Year 2 of this process.

M&N has partnered with subconsultants whom we have worked with successfully on recent prior beach nourishment planning and engineering projects to conduct necessary field investigations:

Amdrill, Inc. (Amdrill) (formerly American Vibracore Services, AVS) will conduct the geotechnical field investigations, sampling, laboratory analyses and analysis reporting, as a subconsultant to M&N. M&N will be responsible for receiving the data products from Amdrill, evaluating the geotechnical data, and assessing the sediment compatibility across the horizontal and vertical extents of the investigated area, to establish compliance with state and federal regulations for using the sediments as beach nourishment material.

Geodynamics, LLC (Geodynamics), a subconsultant to M&N, will conduct the hydrographic survey, sidescan sonar, and sub-bottom profiles. Geodynamics will also coordinate the work of **Tidewater Atlantic Research (TAR)** to capture field data and perform research necessary to evaluate the potential for cultural / archaeological resources within the investigated area. M&N will be responsible for receiving the data products from Geodynamics, evaluating the survey, sidescan and sub-bottom profiles, and utilizing this data to assess the availability of beach quality sand resources within the investigated area.

It is expected that this Task 10 scope of services can be completed within the July 2021-September 2022 timeframe, and the timeframe of these services is discussed throughout this task proposal as Year 2.

TASK 10 SCOPE OF WORK

This Scope of Work defines the services to be provided during Year 2 of the multi-year Master Plan process. These tasks generally include project management, meetings and coordination; field investigations and data analysis; engineering calculations and modeling to determine preferred beach templates and nourishment intervals; and environmental documentation and agency coordination.

10.1 Project Management, Town Meetings and Coordination – YEAR 2

M&N will attend meetings and provide coordination services for the project as needed. It is intended that the meetings and coordination included in Task 10.1 will discuss progress, findings and recommendations related to the various Task 10 work items. As part of the project, M&N expects the following in-person meetings and virtual meetings / teleconferences to occur in the next year of the Master Plan process:

- Four (4) in-person meetings in Nags Head with Town staff to discuss the various coastal engineering professional services tasks;
- Attendance and presentation at two (2) Board of Commissioners meetings to update the Board on



- the progress of the various engineering, monitoring and master plan tasks;
- Standing progress calls / virtual meetings with Town staff, anticipated to occur in months without in-person meetings, for a total of eight (8) such calls.

It is expected that each in-person meeting will include two M&N staff attendance in Nags Head along with their time and supporting staff time to prepare materials for the meetings and to provide meeting notes and summaries.

It is expected that the calls and virtual meetings will include more of the M&N project team and any number of Town staff or other stakeholders that the Town decides to invite to those calls.

This anticipated number of in-person meetings and standing calls does not exclude or limit additional calls between the Town and M&N's points of contact as specific questions and coordination needs arise.

10.2 Borrow Area Field Investigations and Analysis – Phase 1B

In order to confirm the locations and depths of sufficient sand borrow area resources – information that is required for the master plan engineering report and environmental documentation – field investigations will be conducted within the borrow area identified previously by the US Army Corps of Engineers (USACE) as “S1” and shown in Figure 1.

In order to obtain the various required information in a cost-effective manner, M&N proposes to conduct the field investigations in three phases: Phase 1A, Phase 1B and Phase 2. Phase 1A of the field investigation services was included in a prior scope and fee proposal (defined as Task 8), and it is expected to be initiated in June 2021 and completed (weather depending) within June and July of 2021. Phase 2 is described below in Task 10.3.

Phase 1B (this Task 10.2) will capture geological (vibracores with lab analyses, and sub-bottom profiling) and archeological (magnetometer) data on a grid of vibracore locations spaced approximately 1,000 feet apart throughout area S1. Details of the anticipated and budgeted Phase 1B borrow area field investigations are provided in attached scope and fee proposals from Amdrill and Geodynamics.

The Phase 1B survey data will support identification of available sand resources within S1, including identification of sub-areas within S1 where different depths of borrow would be planned and proposed to the regulatory authorities. It is expected that the data collected in Phase 1A and Phase 1B will be sufficient for meeting the N.C. Division of Coastal Management (DCM) requirements for characterizing beach fill borrow areas. However, it is noted that discussions and to be held with the permit agencies may result in adjustments to the borrow area field investigations scope and fee at a later date.

In addition to the field investigations, the Phase 1B scope of work includes engineering analysis by M&N to assess the suitability of sediments within the borrow area for use as future beach nourishment materials and to assess the overall volume available for long-term beach nourishment planning. After the Task 10.2 geophysical and geologic studies have been completed, M&N will complete a sand compatibility analysis and verify that adequate material is available in the borrow site(s) to meet the multi-decadal master plan needs. M&N will outline sub-areas within borrow area S1, and potential borrow depths within each sub-area, for which to request regulatory permissions for dredging to support the long-term nourishment of the Town's beaches.

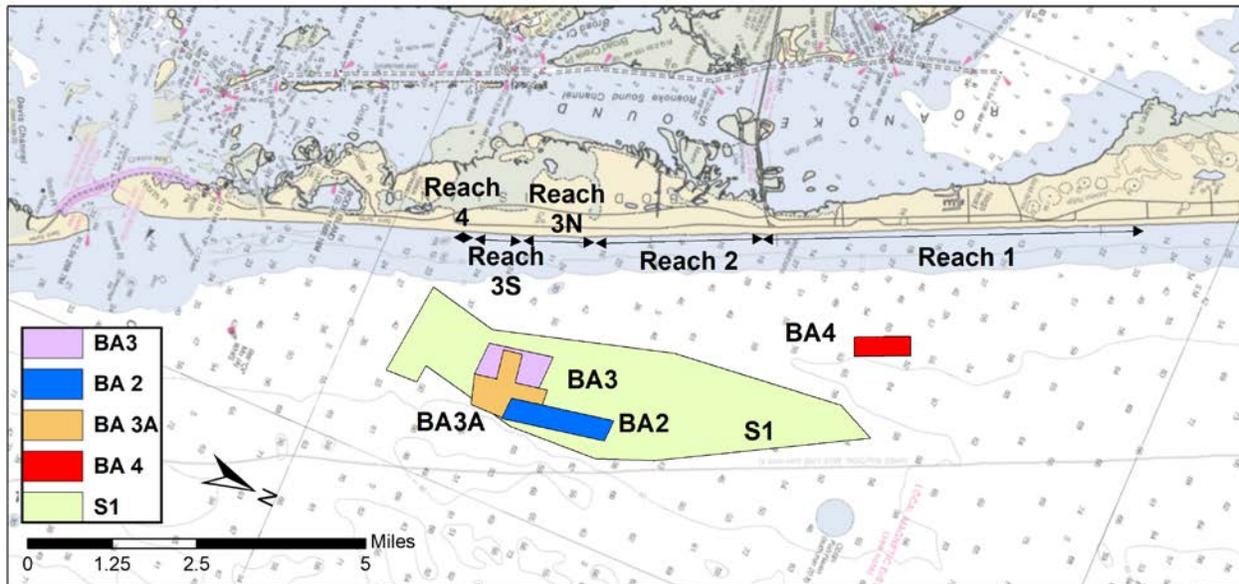


Figure 1. Location of borrow area S1 in relation to prior permitted borrow areas and the Town's beach nourishment reaches

10.3 Borrow Area Field Investigations and Analysis – Phase 2

It is expected that additional sub-bottom profiling and magnetometer surveys and analysis – beyond those conducted in Phase 1A (prior purchase order) and Phase 1B (Task 10.2) above – will be needed to meet N.C. State Historical Preservation Office (SHPO) requirements for dredging the borrow areas. Those additional investigations are proposed as Phase 2 field investigations (this Task 10.3), to be conducted at a later stage of the Master Plan development after M&N has evaluated the findings of Phase 1A and Phase 1B field investigations. Details of the anticipated and budgeted Phase 2 borrow area field investigations are provided in the attached Phase 2 scope and fee proposal from Geodynamics.

The Phase 2 sub-bottom profiling and magnetometer surveys will support SHPO approvals for dredging in the borrow areas and to the depths that the Master Plan scope will identify for long-term beach renourishment borrow needs. It is noted that discussions to be held with SHPO and other permit agencies may result in adjustments to the borrow area field investigations scope and fee at a later date.

10.4 Engineering, Modeling and Funding Analysis and Engineering Report

Based on the findings from the contract Task 2 (Master Plan Year 1) preliminary engineering study and report, that M&N has been finalizing in the Town's 2020-2021 fiscal year, M&N will develop the coastal engineering design addressing the Town's entire Atlantic Ocean shoreline to determine and recommend beach and dune profile templates to best meet and sustain the Town's goals for protecting oceanfront infrastructure and providing for public access and beachfront recreational needs. M&N will continue to refine the assessment of volumes needed for various levels of protection, and will present these revised estimates to the Town so that a decision can be made as to the design of the long-term beach and dune template (based upon a selected level of protection) and the associated volumes and costs for it as well as ongoing maintenance. Various engineering alternatives (no action, status quo, relocation, non-structural and structural, etc.) will be considered as required by USACE and NCDCEM as part of normal NEPA assessments.



Once this decision has been made, it is expected that M&N will support the Town's development of sustainable funding sources. M&N will assist the Town of Nags Head and its financial consultant in considering funding streams for the multi-decadal master plan from Town, State and Federal sources including grants as well as the NC Coastal Storm Damage Mitigation (CSDM) fund and other State/Federal resilience grant programs (e.g., FEMA BRIC).

The CSHORE and GenCade models developed and calibrated under the prior contract Task 2 work will continue to be utilized in Task 10.4. The CSHORE model will be utilized to refine the beach and dune template needed to achieve a selected level of protection and to confirm renourishment thresholds. The GenCade model will be utilized to evaluate a range of renourishment intervals, as well as phased renourishments along different reaches of the Town's shoreline, to develop a preferred renourishment schedule for long-term planning and environmental permitting.

M&N will conduct additional two-dimensional numerical wave, hydrodynamic and sediment transport modeling to evaluate the effects of dredging in the borrow area S1 on the wave climate adjacent to the borrow area and in the nearshore area along the Town's shoreline.

All of the above engineering analyses for determining the sand need for the master plan and the results of the field investigations, sediment sand source study, beach nourishment preliminary design, phasing and renourishment intervals will be summarized in a detailed engineering report to be used to support the environmental documentation and permitting. A draft engineering report will be provided for Town and agency review.

It is anticipated that additional modeling, that would be documented in a revised draft report, along with a final engineering report will be provided in Year 3 after comments from the Town and permitting agencies have been received. The additional modeling and finalized report are not included in this scope of work, and these would be included in a separate future scope of work.

10.5 Environmental Documents, Agency Coordination and Permitting

These services, that have been previously discussed with the Town, are excluded from the present Year 2 scope of work. It is anticipated that the environmental documentation, agency coordination and permitting process would be included in a separate future scope of work, to be begun in Year 3 subsequent to the completion of Task 10.1 through 10.4 services.



TASK 10 PROJECT COST

The total estimated fee for the project for Master Plan Year 2 tasks inclusive of all efforts is lump sum of **\$1,737,907**, including expenses for travel to the Town for meetings and reproduction.

M&N proposes to invoice the Town monthly on a percent complete basis by Task. Our invoice format can be tailored to meet the Town’s requirements and preferences, and the invoice would generally be accompanied by a cover letter or cover sheet summarizing progress on the Task during the invoice period. The fees for each of these subtasks are summarized below:

Task 10: Master Plan Year 2 (July 2021 - September 2022)	M&N Fee
Task 10.1. Project Management, Town Meetings and Coordination	\$67,290.00
Task 10.2. Borrow Area Field Investigations and Analysis - Phase 1B	\$1,031,226.00
Task 10.3 Borrow Area Field Investigations and Analysis - Phase 2	\$314,457.00
Task 10.4 Engineering, Modeling and Funding Analysis and Engineering Report	\$324,934.00
Total for Task 10	\$1,737,907.00

TASK 10 PROJECT SCHEDULE

The attached schedule chart indicates the approximate timeframes initially anticipated for major events and work products within the overall Task 10 project schedule. It is noted that the Phase 1B geological field investigations are on the critical path as they require summer weather to complete efficiently, and would ideally be scheduled to be completed in the July – September, 2021 timeframe.



Initial Schedule of Major Events within Task 10 Scope of Work																				
Task	2021						2022													
	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	
NTP																				
Task 10.1. Project Management, Town Meetings and Coordination																				
Attendance at Town Board meetings																				
In-person meetings with Town staff																				
Task 10.2. Borrow Area Field Investigations and Analysis - Phase 1B																				
Task 10.2. Borrow Area Field Investigations and Analysis - Phase 2																				
Task 10.4 Engineering, Modeling and Funding Analysis and Engineering																				
Evaluate Borrow Areas Within S1 and Plan Phase 2 Field Investigations																				
Refine Levels of Protection and Evaluate Nourishment Intervals																				
Draft Engineering Report																				