

SCOPE OF WORK

Project Background

The following language is taken from House Bill 709 which authorizes the terminal groin study.

"The Coastal Resources Commission, in consultation with the Division of Coastal Management, the Division of Land Resources, and the Coastal Resources Advisory Commission, shall conduct a study of the feasibility and advisability of the use of a terminal groin as an erosion control device at the end of a littoral cell or the side of an inlet to limit or control sediment passage into the inlet channel. For the purpose of this study, a littoral cell is defined as any section of coastline that has its own sediment sources and is isolated from adjacent coastal reaches in terms of sediment movement."

The overall goals and objectives for the terminal groin study as outlined by the original legislation can be summarized as follows:

- 1. Characterize physical and environmental impacts of terminal groin structures,
- 2. Determine engineering techniques used to construct terminal groins including those which may help minimize impacts on adjacent shorelines,
- 3. Determine economic impacts of shifting inlets as well as potential construction/maintenance costs of terminal groin structures, and
- 4. Determine whether the construction of terminal groins is both feasible and advisable in North Carolina, and if so, what are the types of locations where such structures function as designed with minimal impacts.

The project team will collaborate to meet each of the goals outlined above. The general strategy for addressing each service is identified below.

Task 1 – Coastal Engineering Analyses of the Effectiveness and Impacts of Terminal Groins – (3 Months (Sept – Nov) - \$105,580)

M&N will participate in a project kickoff meeting with State personnel including the Coastal Resources Advisory Council and the Division of Land Resources to further refine the goals of the project. M&N will then undertake a significant data collection effort to collect available data on terminal groin projects within the Southeast. It is expected that projects will be investigated within North Carolina, Virginia, South Carolina, Georgia and the east coast of Florida. M&N will contact the USACE Norfolk, Wilmington, Charleston, Savannah and Jacksonville Districts to collect preliminary data on applicable projects. M&N will complete similar data collection efforts for local and regional universities, local and regional municipalities, and other applicable agencies. Once the preliminary data has been collected, M&N will conduct a screening process to select eight (8) applicable projects for detailed study. The projects will be selected to cover a range of size and dimensions (lengths, heights, and porosity), sediment transport patterns, locations (inlets; navigable, dredged inlets; and at the end of a non-inlet littoral cell), etc. as available.

M&N will contact the appropriate agencies and communities listed above to collect and review more detailed data sets for each of the eight (8) sites. The detailed data will include physical and environmental monitoring, a history of beach nourishment and dredging projects, and other applicable datasets. M&N will collect the "raw" datasets to be sure that no biasing of the analyses will be present.

M&N will also develop procedures to determine the impacts that nourishments and dredging have had on the localized shoreline and profile change rates so that truer "net" impacts can be estimated. These procedures will be based upon analytical analyses of the available data. These developed procedures will be transparent so that interested parties can reproduce the analyses if desired.

M&N will complete analyses of the existing eight (8) selected projects to estimate the effectiveness of the terminal groins as well as their impacts on adjacent shorelines. The external influences (such as nourishment and dredging) will be accounted for to the maximum extent practicable and the analyses will again be transparent enough to be reproduced by other parties if desired. A geological assessment of terminal groins and potential limitations will also be completed.





<u>Deliverables</u>

• A draft technical memorandum (TM) will be developed summarizing the data collection, the analyses procedures, and the results of the coastal engineering assessment by November 30, 2009.

Assumptions

• An appropriate level of data is assumed to be available for eight (8) regional sites. Significant gaps in data will be noted in physical as well as environmental data. If an appropriate level of detail is not available for eight (8) regional sites, the scope of work and fees (for the analyses subtasks) will be reduced to a level to satisfactorily complete the actual number of sites that are analyzed. No new data collection efforts will be performed under this task.

<u>Task 2 – Environmental Analyses of Potential Impacts of Terminal Groins – (3 Months (Sept – Nov) -</u> <u>\$71,190)</u>

SEE ATTACHED DIAL CORDY SCOPE OF WORK BELOW.

DIAL CORDY SCOPE

Subtask 1: Literature and Data Collection and Review

DC&A will locate, compile, and review past scientific, engineering, and publicly accessible information and data related to historical terminal groin projects in VA, NC, SC, GA, and FL. Past information will be identified from web-based literature searches, contacts made with applicable state and federal agencies, coastal engineering firms, and libraries. Information identified will be collected from identified sources and reviewed for usefulness in assessing natural resource effects. DC&A will review the projects' pre-construction coastal conditions supporting the projects' need and the projects' post-validation. DC&A will review the projects' engineering approaches in terms of each site's natural resources, potential effects from construction, equipment, timelines, and operation and maintenance. DC&A will review the availability of pre-construction natural resource data, post project validation measures and data, required mitigation, available post resources' monitoring results, and operation and maintenance requirements. DC&A will attempt to find representative projects at both inlets; navigable, dredged inlets; and at the end of a non-inlet littoral cell locations throughout the Southeast and Mid-Atlantic States. A database of literature and references collected will be catalogued and included in the report.

Subtask 2: Project Selection and Assessment

DC&A, with feedback from Moffatt & Nichol, will select eight representative projects along with peer reviewed scientific literature, to prepare an assessment of terminal groins' effects on natural resources (marine, terrestrial, associated biota and habitats) and protected species. DC&A will contact and interview regional and state experts, project sponsors, and participants associated with each selected terminal groin project. DC&A will assess terminal groins' potential effects on the marine benthic community, shorebird use, fisheries, dune habitat and associated biota, and protected species (marine reptiles, marine mammals, shorebirds).

Subtask 3: Mitigation Measures

DC&A will describe mitigation approaches (e.g. sand bypassing, monitoring, etc.) that have been considered as permitting requirements. Such mitigation approaches may be considered as permitting stipulations when assessing potential natural resource effects from potential terminal groin construction and maintenance.

Subtask 4: Report Preparation

DC&A will prepare, from collected data and reports, a written report summarizing the project's purpose, technical approach, general background on terminal groins potential effects on natural resources, site specific summaries from selected projects, literature and references cited or collected, and a list of contacts and sources of information. DC&A will also provide a comparative matrix breakdown by resource community and assessed project. The report will also include graphics depicting the location and setting of the selected terminal groin projects. A draft report will be submitted by November 30, 2009.

Subtask 5: Meeting Participation

DC&A will participate in the planning and consolidation of three public hearings' comments facilitated by NCDCM.





<u>Task 3 – Study of Engineering Construction Techniques to Limit Potential Impacts of Terminal</u> <u>Groins – (1 Month (Dec) - \$9,730)</u>

M&N will conduct a literature review of engineering construction techniques used to limit the potential impacts of terminal groins on adjacent shorelines. Expected techniques include limiting groin height and length as well as not allowing the installation of an impermeable core so that the porosity of the structure is increased.

M&N will also develop <u>schematic</u>, idealized desktop GENESIS models to further test these construction techniques and their impact on sediment transmission through the structure. Two wave cases will be run (average wave conditions and storm wave conditions) and relative sediment transmission will be recorded for each case. Eight (8) separate structural configurations (height, length, porosity) will be run for each wave case.

Deliverables

• A draft technical memorandum (TM) will be developed summarizing the literature review, the analyses procedures, and the results of the assessment by December 31, 2009.

Assumptions

• The State will assist M&N in the selection of an idealized beach case as well as the wave conditions and alternatives to run within GENESIS.

<u>Task 4 – Economic Study of Impacts of Shifting Inlets to State, Local and Private Sectors – (3</u> <u>Months (Nov-Jan) - \$32,900)</u>

M&N will provide coastal engineering guidance to Dr. Dumas as needed for the study and outlined in his attached scope of work.

SEE ATTACHED SCOPE OF WORK BELOW FROM DR. CHRIS DUMAS

DUMAS SCOPE

(8 hours) Consult with coastal engineers to define (i) a "baseline" inlet erosion management policy using dredging, nourishment and temporary erosion control structures (TECSs) without use of terminal groins, (ii) an "alternative" inlet erosion management policy using terminal groins and (iii) an unimpeded inlet shifting with structure retreat/removal policy option for analysis.

(8 hours) Consult with weather and climate experts, coastal engineers to identify likely future sea level, storm event, and Erosion Potential Scenarios. (Perhaps 2-3 scenarios)

(16 hours) Consult with coastal engineers and policy makers to identify likely federal agency (USACE, USFWS, etc.) actions, state agency (NCDCM, NCDMF, NCDOT, etc.) actions, local government actions (zoning, etc.), and private sector (homeowner, developer, etc.) actions under Policies (i), (ii) and (iii).

(12 hours) In conjunction with coastal engineers, assemble current private and public property location and value data.

(24 hours) Identify likely future property value appreciation scenarios under Policy (i), Policy (ii) and Policy (iii) for each Erosion Potential Scenario.

(0 hours, assume M&N will complete) Identify likely locations and magnitudes of future erosion events under Policy (i), Policy (ii) and Policy (iii) for each Erosion Potential Scenario.

(0 hours, assume M&N will complete) Assess cost of erosion control activities (dredging, nourishment, TECSs, terminal groin construction/maintenance) of Policy (ii) and Policy (iii) relative to Policy (i) for each Erosion Potential Scenario.

(90 hours) Assess current and future (50-year horizon) economic value of property losses under Policy (i), Policy (ii) and Policy (iii) for each Erosion Potential Scenario, by inlet for multiple inlets, in the following categories:

- Private property loss
 - Direct loss
 - Diminished current market value due to risk of future loss
- Public property and infrastructure loss





- o State
- o Local
- Tax Base Loss
 - o State
 - o Local
- Less value of any accretion gains

Calculate and compare net economic impact (cost of erosion control activities + economic value of property losses) of Policy (i) with that of Policy (ii) and Policy (iii)

(24 hours) Draft sections of report documenting methodology, results and conclusions of economic impact analysis.

(16 hours) Edit report sections and reply to review comments.

TOTAL HOURS: 198 @ \$100/hr

TOTAL COST: \$19,800

<u>Deliverables</u>

• A draft technical memorandum (TM) will be developed summarizing the literature review, the analyses procedures, and the results of the assessment by January 15, 2010.

Assumptions

• The State will assist M&N and Dr. Dumas with policy issues and scenarios as outlined above.

<u>Task 5 – Study of Initial Construction and Maintenance Costs of Terminal Groins – (1 Month (Dec) -</u> \$12,440)

M&N will conduct a literature review of initial construction and maintenance costs available for existing terminal groins including private and public costs.

M&N will also develop ranges of potential initial and maintenance costs based on expected varying lengths, heights and porosities of potential terminal groins. The effects of various beach slopes will also be included by studying various profiles along the NC coast to determine appropriate range of slopes that may be encountered.

<u>Deliverables</u>

• A draft technical memorandum (TM) will be developed summarizing the literature review, the cost analyses procedures, and the results of the assessment by December 31, 2009.

Assumptions

• Three (3) various offshore slopes and their effect on initial and maintenance costs will be included within the study.

Task 6 – Study of Potential Locations of Terminal Groins – (1 Month (Jan) - \$17,420)

M&N will conduct a literature review of locations (inlets; navigable, dredged inlets; and at the end of a non-inlet littoral cell) available for existing terminal groins.

M&N will also develop <u>schematic</u>, idealized desktop GENESIS models to test terminal groin locations and their impact on sediment transmission through the structure and potential impacts to adjacent shorelines. Two wave cases will be run (average wave conditions and storm wave conditions) and relative sediment transmission and adjacent shoreline impacts will be recorded for each case. Eight (8) separate structural configurations (height, length, porosity) will be run for each wave case.

<u>Deliverables</u>

• A draft technical memorandum (TM) will be developed summarizing the literature review, the analyses procedures, and the results of the assessment.





Assumptions

• None.

Task 7 – Public Input (Ongoing - \$3,840)

M&N will provide one (1) staff member at three (3) planned public meetings. It is assumed that these would be held at the CRC meetings planned for October 2009 and in January and March of 2010.

Deliverables

• None.

Assumptions

- The State will be responsible for advertising meetings, coordinating meeting logistics, preparing public presentations, leading technical discussions for each of the meetings, and preparing meeting summaries.
- M&N staff will be responsible for assisting the State during the meetings in recording public input and providing our notes to the State.

<u>Task 8 – Prepare Draft and Final Report. Project Administration & Meetings (2 Months (Feb-Mar) – \$34,320)</u>

Based on the findings from Tasks 1 through 7, the project team will develop a comprehensive report for the State of North Carolina. A draft report will be submitted to the State in February with a final report submitted in March. A summary Powerpoint presentation will be developed and provided to the CRC for use in its presentation of findings to the Environmental Review Commission and the General Assembly. Multiple internal meetings and conference calls (assumed monthly) with the client are also envisioned as well as effort to handle project paperwork and administration.

Deliverables

- Draft report February 1, 2010
- Final report March 1, 2010
- Summary Powerpoint presentation
- Monthly project progress reports

Assumptions

• The State will be provide documentation and writeup for the public input portion of the study.

PROJECT FEE

The estimated fee for the project is **\$287,420**.





PROJECT SCHEDULE

The total project duration is expected to be 7 months (September - March).

TASK	SEP	ост	NOV	DEC	JAN	FEB	MAR
1 - Coastal Engineering Analyses of Potential Impacts of Terminal Groins							
2 - Environmental Analyses of Potential Impacts of Terminal Groins							
3 - Engineering Construction Techniques to Limit Impacts							
4 - Economic Study of Erosion Impacts							
5 - Initial Construction Cost and Maintenance Cost Study							
6 - Study to Determine Potential Use at Inlets Only or Other Locations							
7 - Public Hearings							
8 - Draft and Final Report, Project Management & Admin							

CONFLICT OF INTEREST STATEMENT

Moffatt & Nichol, Dial Cordy & Associates and Dr. Chris Dumas to the best of our knowledge do not have any conflict or potential conflict of interest in terminal groins, e.g., ownership of oceanfront properties that would benefit from terminal groins, agreements with units of local government to perform engineering or environmental studies of terminal groins.





Date: 21-Aug-09

Dual Number:

Notice-to-Proceed Date:

Total

PROJECT TASK COMPLETION CHECKLIST

Firm: Molfatt & Nichol
Project : NCDENR - Terminal Groin Study Associated with an Update of the Beach and Inlet Management Plan for the State of North Carolina

Scoping Date

TASK CADD/ Supervisory Coastal Coastal Coasta Totals . Coastal Project Engineer III Enginee Engineer TECH Engineer Manager Ш Ш Clerical Hrs. 1 Billing Rates 180.00 Hrs. 4.00 160.00 Hrs. 4.00 140.00 105.00 95.00 80.00 60.00 Task 1 - Coastal Engineering Analyses of Potential Impacts of Terminal Groins Kickoff Meeting Collect Data on Existing Projects Hrs. Hrs. Hrs. Hrs. Coordination and Data Collection with USACE Coordination and Data Collection with Universities Coordination and Data Collection with Local Municipalities & Consultants Coordination and Data Collection with Others 4.00 8.00 16.00 8.0 16.00 8.00 24.00 16.0 32.00 Review Data on Existing Projects (Assume 8 Total) GEOLOGICAL ASSESSMENT OF TERMINAL GROINS (SUBCONTRACT - ASSUME 15K) Develop Procedures to Determine Net Terminal Groin Impacts (Account for Nourishment) Complete Analyses for Existing Projects (Assume 8 Total) Develop Summary TM 8.00 48.00 64.00 4.00 24.00 16.00 64.00 96.00 128.00 4.00 12.00 Task 1 Totals Task 2 - Environmental Analyses of Potential Impacts of Terminal Groins 32.00 136.00 236.00 316.00 720.00 \$90,580 SEE DIAL CORDY ESTIMATE Fask 2 Totals \$0 Task 3 - Engineering Construction Techniques to Limit Impacts 1.00 2.00 Literature Review of Engineering Construction Techniques Simple Model Cases Using GENESIS to Determine Construction Techniques Impacts 2.00 16.00 4.00 8.00 40.00 Develop Summary TM Task 3 Totals 1.00 2.00 4.00 42.00 80.00 \$9,730 Task 4 – Economic Study of Erosion Impacts Provide Coastal Engineering Guidance to Dr. Dumas ECONOMIC ANALYSIS (SEE DR. DUMAS ESTIMATE) Develop Surmary TM Tork 4 Turking 12.00 24.00 60.00 4.00 8.00 2.00 60.00 110.00 \$13,100 2.00 16.00 32.00 sk 4 Totals Task 5 - Initial Construction Cost and Maintenance Cost Study iterature Review of initial Construction and Maintenance Costs levelop Range of Initial/Maintenance Costs Depending on Structu 2.00 24.00 8.00 48.00 evelop Summary TM 1.00 2.00 4.00 ask 5 Totals 4.00 12.00 32.00 56.00 104.00 \$12,440 Task 6 - Study to Determine Potential Use at Inlets Only or Other Locations 1.00 12.00 2.00 16.00 Literature Review of Terminal Groin Locations and Potential Impacts Due to Location Simple Model Cases Using GENESIS to Determine Location Impacts 4.00 24.00 64.00 Develop Summary TM Task 6 Totals Task 7 - Public Hearings 1.00 6.00 4.00 22.00 8.00 40.00 76.00 144.00 \$17,420 Attend Three (3) Public Meetings @ CRC Locations 24.00 ask 7 Totals 24.00 24.00 \$3,840 -Task 8 - Draft and Final Report, Project Management & Admir Develop Draft Report 8.00 24.00 40.00 80.00 Develop Summary Powerpoint Presentation for NCDENR Develop Final Report 2.00 16.00 32.00 8.00 8.00 12.00 16.00 8.00 4.00 12.00 roject Management, Paperwork, Billing, Reporting & Admin Task 8 Totals 14.00 68.00 68.00 120.00 270.00 \$34,320 Total Man-Hours: 63.00 289.00 430.00 670.00 1,452.00 - 670.00 \$0 \$63,650 \$0 \$0 \$181,430 \$181,430 Total Personnel Expenses: \$11,340 \$46,240 \$60,200

==> Total M&N Expenses: \$

\$181,430 ==> Total Subcontractor Expenses: \$ \$105,990 ==> Total Project Fee: \$ \$287,420

SEE DIAL CORDY & CHRIS DUMAS WRITEUPS (ALSO INCLUDES \$15k FOR GEOLOGICAL ASSESSMENT)

Dial Cordy Fee

Terminal Groins, Natural Resources' Pre and Post Construction Assessments North Carolina Division of Coastal Resources August-09

	Classification :		Project	Senior	Senior	GIS	Production			
		Principal	Manager	Scientist II	Scientist I	Specialist	Manager	Clerical	Subtask	Subtask Fee
Task	Rate :	\$180.00	\$150.00	\$100.00	\$90.00	\$75.00	\$65.00	\$50.00	Hourly Summaries	Summaries
Tack 1 Historical Project Screening										
State Contents				8					8	\$800.00
State Archival Review				48	50				98	\$9,300,00
Broject Contents				40	50				90	\$9,300.00
Project Contacts				40	50				09	00.000
Project Archival Review		4		40	24				50	\$9,300.00
Tool: 2 Projects Fiel-Screening		4	0	20	24				50	\$0,080.00
Task 2 Project Selection and Data Assessments (6)				40	50				09	\$0,200,00
Context Internations				40	50				50	\$9,300.00
Contact Internviews				10	50				10	\$1,600.00
Data Assessments				48	50				98	\$9,300.00
Task 3 Project Mitigation Effects Measures				05					50	A 750 00
Operation and Maintenance Requirements				25	25				50	\$4,750.00
Mitigation Assessment Efforts				25	25				50	\$4,750.00
Task 4 Report Preparation			_							
Preparation		4	8	20	20	24		24	100	\$8,720.00
Task 5 Public Hearings Participation (3)		_	_							
Preparation		8	8						16	\$2,640.00
Public Hearing Comment Consolidation			24						24	\$3,600.00
Other Direct Cost and Travel									Labor	\$70.940.00
									ODC	\$250.00
									Total	\$71,190.00

