

**MEETING MINUTES**  
**CRC SCIENCE PANEL ON COASTAL HAZARDS**  
September 29, 2009

Division of Coastal Management  
2728 Capital Blvd  
Air Quality Training Room  
Raleigh, NC 27604  
(notes compiled by Jeff Warren, DCM)

**Panel Members in Attendance:**

Steve Benton, DCM retired  
Bill Berkemeier, USACE ERDC  
Tom Jarrett, CP&E  
Dave Mallinson, ECU  
Margery Overton, NCSU  
Stan Riggs, ECU  
Spencer Rogers, NC SeaGrant  
Beth Sciaudone, NCSU adjunct / consultant  
Rob Young, WCU

**Panel Members not in Attendance:**

Bill Cleary, UNCW  
Pete Peterson, UNCCH IMS  
Tony Rodriguez, UNCCH IMS  
Greg Williams, USACE

**DENR/DCM Staff in attendance:**

Robin Smith, DENR  
Jim Simons, Land Resources  
Ken Taylor, Land Resources  
Jim Gregson, DCM  
Ken Richardson, DCM  
Guy Stefanski, DCM  
Steve Underwood, DCM  
Michele Walker, DCM  
Jeff Warren, DCM

**Other Attendees:**

Numerous attendees from the general public were present and introduced. Organizations represented included Coastal Federation, NCBIWA, Moffatt & Nichol, Environmental Defense, Wilmington BASE, ECU, WCU, Dial Cordy, and US Fish & Wildlife. A sign-in sheet was not distributed.

## MEETING SUMMARY

Margery Overton opened the meeting at 9:15, a final agenda was passed out, and introductions were made. Jim Gregson reviewed the language of HB 709, specifically the directive requiring the Coastal Resources Commission addressing terminal groins. The Science Panel meeting is not considered to be one of the three public meetings required by the law. The final report must be presented to the ERC no later than April 1, 2010. Overton asked Gregson to clarify why the Science Panel was asked to address the issue of terminal groins. Gregson noted that the CRC wanted input from the Science Panel on not only the scope of work but also the study sites for existing terminal groins. The project team (Moffatt and Nichol, et al.) will be responsible for collecting the data, the CRC will be responsible for the report and presenting the data to the General Assembly, and the Science Panel will be used for peer review of the study and provide guidance during the study. As M&N gets information, it will be forwarded to the Science Panel. Michele Walker, DCM PIO, has already set up a website to aid in this delivery. Walker noted the URL of the DCM webpage ([www.nccoastalmanagement.net](http://www.nccoastalmanagement.net)) and identified the CRC Terminal Groin Study link on the right side of the page under the "What's New?" heading on the DCM homepage. This page already has information posted on it including the public maps from the previous CRC terminal groin study meeting in New Bern.

Steve Benton asked about the level of involvement of the Science Panel in the actual scoping of the project. The general scope had already been defined by the Legislature but the Science Panel would still be involved in providing input on the details of the study. Overton mentioned that this was the first true Science Panel meeting solely to discuss the terminal groin project and provide input on the study.

Paul Tschirky from M&N presented the overall project work plan (eight tasks):

1. Coastal engineering analyses of effectiveness and impacts of terminal groins
2. Environmental resource analyses of potential effects of terminal groins
3. Construction techniques to limit impacts
4. Economic study of impacts of shifting inlets
5. Initial construction and maintenance costs
6. Potential locations study
7. Public input
8. Draft and final report

The project schedule is seven months (Sept. 2009 to March 2010). Three public hearings have been announced at the next three CRC meetings (Atlantic Beach in October, Raleigh in January, and Sunset Beach in March). Gregson added that there will an additional CRC meeting scheduled between January and March to provide input to the project earlier in the schedule. It was noted that these public hearing meetings coincided with CRC meetings and not Science Panel meetings.

Tschirky stated that today's meeting would focus on choosing the existing terminal groin sites on the east coast to study as well as the methodology that should be used to study

them. Eight sites will be chosen in the southeast. Northeastern sites can also be used if necessary. Coastal analyses will overlap as much as possible with environmental analyses. Rob Young asked about why eight sites were chosen and Tschirky responded that sites can be added or dropped as per the Science Panel and the actual number was not stipulated by the General Assembly. Overton noted that everyone wanted to choose the “best” sites but one of the challenges today would be defining the criteria of what is used to define “best.”

Tschirky differentiated between jetties, groins, and terminal groins, defining a terminal groin as a groin, often at the end of a littoral cell or at the updrift side of an inlet, intended to prevent sediment passage into the channel beyond (USACE definition from the Coastal Engineering Manual). Young pointed out that jetties, as defined by the USACE, don’t necessarily have to be “long.” Spencer Rogers agreed and suggested that they can be differentiated on function (jetties are for navigation and terminal groins are not).

Tschirky noted that the identified groin structures on the map that was handed out would be discussed from north to south for a general consensus. Young asked if one qualifier would be coastal conditions similar to North Carolina. Overton said that could be one of the variables used to screen out the ones that would be discounted in the study. Bill Birkemeier stated that you could either go through the list first and then define the criteria or vice versa. Overton mentioned that the first criteria (the definitions from the USACE) had already been defined. Tom Jarrett disagreed because he interpreted that the legislation was addressing groins at inlets although the language could be misleading.

Tschirky noted that maybe one structure not at an inlet but at the end of the littoral cell could be included in the study.

Tschirky made a first pass at the list of engineered structures and highlighted ones that were not at inlets, ones that were double-sided (one structure on each side of the inlet) and could be interpreted as jetties, and highlighted ones that might be used. Rogers reiterated that jetty structures are for navigation channel stabilization. Terminal groins are used for stabilization of the shoreline in the same vicinity but have no bearing on navigation channels (function over form). Overton felt that the Panel could accept Rogers’ definition and use it as a guideline to choose the study locations. Young added that the Panel should only be looking at structures for stabilization at the end of an island. Beth Sciaudone asked to see aerial photos of all structures before any decisions were made.

**Coney Island, NY** – not at actual end of inlet but a groin field near the inlet. The function of the last groin in the groin field is for sand retention. Jeff Sheldon added that the westernmost groin was installed by the USACE to retain the sand from the federal project. This is a data rich site. It is a terminal groin but may not be applicable to North Carolina. Science Panel did not want to include in study.

It was noted that the legislation directed the study of using a single terminal groin as an erosion control structure and not a terminal groin field.

**Rockaway, NY** – terminal groin that meets definition of Panel but the coastal setting is not analogous to NC coastal processes. Studying downdrift impact would be difficult at this structure (i.e., nothing downdrift). This could also be considered a data rich site. It is a rock structure but is an isolated structure and impossible to assess impact to adjacent (downdrift) shoreline. Science Panel did not want to include in study.

Jarrett noted that the two reasons NC prohibited hardened structures were impacts to adjacent shorelines and public beach access. Benton felt that it was broader than that if you looked at the rules as a whole.

There was discussion about choosing the study sites and the criteria for choosing the sites. Benton proposed three criteria for selecting sites: 1) is it a terminal groin or not, 2) is it similar to potential NC scenarios, 3) has comprehensive impact analysis been done for the sites (i.e., are they data rich in terms of ecological and physical coastal processes).

**Ocean City Inlet, Maryland** – Is this a terminal groin or a jetty? Rogers suggested throwing it out. Jarrett stated it was navigation. Science Panel did not want to include in study.

**Willoughby Spit, Virginia** – Structure at end of spit with adjacent related structures parallel to beach. Also offshore breakwaters. No downdrift beach and different physical environment than NC (entrance to Hampton Roads shipyards at Norfolk). It's way out in the bay. Not a single structure (a suite of engineered structures). Science Panel did not want to include in study.

**Chesapeake Beach, VA** – a terminal structure that is not at an inlet. Rock structure. Panel suggested that this is not at end of littoral cell. Included as an example because it was not at an inlet. Science Panel did not want to include in study.

**Oregon Inlet, NC** – terminal groin at inlet. Include in study.

**Cape Hatteras lighthouse groins, NC** – included in dataset because groin is not at an inlet. Three groin fields near old lighthouse site. It's not at end of littoral cell. Structures are failing and not maintained. This is a groin field and not a single terminal groin and has behaved as such. Science Panel did not want to include in study.

**Fort Macon, NC** – purpose of structure was to protect Fort Macon from westward migration of Beaufort Inlet (Shackleford spit was growing rapidly to the west). Groin installed in stages with a few small beach fills, which eventually got overtaken by beach fill from Morehead Harbor. It is a groin. It is going to be difficult to study area because navigation channel cuts through inlet and disrupts sand bypass and a lot of beach fill has occurred on Bogue Banks. Downdrift impact is caused in part by groin and in part by channel. Rogers commented that there needed to be a good understanding of all the historical structures associated with Beaufort Inlet as well as dredging and beach fill. This will be used in study.

**Shell Island, NC** – there was a sandbag structure here protecting Shell Island and it acted as a revetment. It was not a terminal groin. Rogers noted that a terminal groin had been applied for via variance with the CRC but was rejected. Sciaudone felt it might be worthwhile to discuss numerous erosion control structures in North Carolina. Overton reminded people of the overriding scope of the study regarding terminal groins.

**Folly Beach, SC** – Four structures viewed in aerial (radial groin) and not one structure. Site also impacted by navigation project for Port of Charleston. Wave climate is similar but tidal setting different. It's not a single structure (but neither is Fort Macon at Beaufort Inlet). Stan Riggs noted that there were multiple structures at a lot of the inlets viewed and that was worth noting – once you start this, you end up adding more and more. Panel voted not to include this in study.

**Hunting Island State Park, SC** – a terminal groin has been designed for this site but it was not built. The design can be analyzed along with cost but impact cannot be analyzed. There is an old structure there, however. There is some interest to consider this further by the Panel.

**Hilton Head, SC** – Rogers noted that the groin was way up the inlet shoreline and not on the oceanfront shoreline, similar to Bald Head Creek inside the inlet (NC). The Panel was not going to include this in the study.

**Tybee Island, GA** – Structure to the north and south at this inlet. Multiple structures on south side of inlet. On south side, there is another structure that juts out from the shore-perpendicular groin. This will be a maybe.

**South Amelia Island, FL** – this is a flow-through terminal structure to allow for sand bypass. It is a terminal structure. It is a recent structure so not a lot of monitoring data exists. Downdrift impact may not yet be manifested due to the newness of the structure. It is on the updrift side of the inlet. The North Carolina structures are on the other side of the inlet (looking at overall regional sediment transport). This will be included in the study.

**St Lucie Inlet, FL** – Terminal structure with numerous offshore breakwaters but the structure is a jetty. This will not be included in the study.

**Jupiter Inlet, FL** – Jarrett noted that they wanted them to be jetties but they really weren't. They are terminal structures but they exist on both sides of inlets. Inlet was opened during a storm, and then it closed and was re-opened and is now artificially stabilized. This is a jetty system and will not be used in the study.

**Bakers Haulover Inlet, FL** – designed for navigation. Tschirky noted this was described by Bob Dean as functioning as a terminal groin but maintained for navigational purposes. Jarrett noted you can look at dredging history and, if that hasn't changed, then

you can determine if structure is working to preserve navigation. Both sides of inlet are heavily beach filled. This is also not a natural inlet. This will not be included in study.

**Bonita Beach, FL** – This is on the Gulf coast and is a terminal structure that is trapping sand but physical coastal setting is different than NC (less energetic). This may be considered in the study.

**Captiva Island, FL** – terminal structure (boulders) that is trapping sand and downdrift impact can be assessed although physical setting is different (lacks a lot in wave action and grain size is different – much finer). Data rich. Young pointed out a huge portion of structure is behaving like a seawall. This may be considered in the study (and is better than Bonita Beach).

**Boca Grande Lighthouse, Gasparilla Island, FL** – terminal structure although there is a newer terminal structure built adjacent to a pre-existing one. Armored shorelines around both corners may limit studying impacts to adjacent beaches. This site will not be included in the study.

**Blind Pass, FL** – small inlet heavily dredged that periodically closes. Structures on both sides of the inlet. Very little water moves through inlet (so setting is different). Sandbag t-groins adjacent to inlet. This one might be a maybe to discuss impacts of the groins.

**Johns Pass, FL** – Structures on both sides of inlets (although northern structure is relatively old). The secret to understanding this inlet is understanding why the shoal of the ebb tide delta collapsed (not related to inlet structure). Larger tidal prism through this inlet versus prior inlet (Blind Pass). Maybe come back to this one? If this one is used, Blind Pass should be eliminated.

**Clearwater Pass, FL** – structures on both sides of inlet that have dual purposes (sand retention and navigation channel stabilization). North side was built first. Structures are longer than previous inlet (Johns Pass) so this one might be better to study versus Johns Pass (if these dual-use structures are considered in the study).

If an inlet site with a structure on both sides of the inlet is used in the study (and there is still ongoing debate on that), then Johns Pass should be used. However, analysis needs to step back in time to look at inlet when just one structure was there and maybe address whether second structure was put in place because of the impact of the first structure.

**Honeymoon Island, FL** – one of the most heavily altered oceanfront sites in Florida. Structure is not at an inlet but it is a very data rich site. This is not location of a littoral cell but rather where pre-existing structure had been. Do not include in this study.

Upon review, the inlets considered for study are:

Oregon Inlet, NC

Fort Macon, NC

South Amelia Island, FL

Captiva Island, FL  
Johns Pass, FL

Hunting Island and Tybee Island were initially “maybes” but, upon further discussion, both Hunting Island and Tybee were discounted. Overton did note that if there were not enough data found for the five inlets selected, the Panel might need to revisit some of these other sites that had been considered as alternates.

Overton adjourned for lunch at 11:50 and reconvened at 1:15. Three things need to be discussed this afternoon: 1) methodology of the analysis for the five terminal groins chosen, 2) hear about the plan for environmental assessment of the inlets, and 3) discussion of the next meeting date to discuss terminal groins (and it may be that a meeting is scheduled and cancelled if not needed, but it’s important to get something scheduled just in case).

Tschirky reviewed M&N’s plan on the methods to determine impacts of terminal groins. Data collection and assessments will be site specific, and the applicability to North Carolina individual inlets will not be considered. Analyses and studies will focus on what can be learned from existing installations and what those lessons mean for applicability in NC. Modeling to be done will be schematic (desktop level analyses). Additional details were provided by Tschirky in his Powerpoint presentation, which is not included in minutes verbatim but has been posted on the terminal groin project website for reference ([www.nccoastalmanagement.net](http://www.nccoastalmanagement.net)).

Rogers and Jarrett commented on issues related to the use of beach nourishment and construction of terminal groins. The question was asked on how M&N would analyze the coupled impact of beach nourishment and terminal groins. Tschirky noted that the easiest way to quantify the impact of a terminal groin is to look at net shoreline change up and downdrift. It is tougher to consider delta volume and shape changes as well as environmental habitat. The law also refers to coastline which is interpreted as shoreline change effects rather than other variables such as offshore bathymetry.

Riggs asked how the historical perspective would be established (i.e., historic storm patterns and the evolution of the barrier island and inlet). Tschirky noted that the available data certainly will dictate what analyses and methods can be accomplished. Riggs also asked about how geological factors would be addressed. Dr. Duncan Fitzgerald of Boston University will be a subcontractor with M&N to advise them on this issue. Benton was concerned that the geologic scope was so massive yet so very important that the data really needed to be given appropriate consideration (and he was unsure from the scope whether it would).

A brief discussion ensued about the availability of limited sand in the southern part of the State and what would happen to the sand budget if a terminal groin was put in place. Benton also pointed out that the coupling of terminal groin construction with a beach fill project made the location and quality of sand a major technical component that needed to be addressed but was not included in the legislation.

Layton Bedsole from Dial Cordy spoke on assessing the environmental effects of terminal groins. Protected species (and their habitats) will be the primary focus of the environmental analyses. Bedsole noted that this portion of the project will be heavily dependent on the environmental impact assessments associated with the terminal groin sites chosen for the study. Bedsole commented that existing data would need to be used and no new data would be obtained. Riggs was concerned that environmental assessments had not included studies of the entire barrier island morphology. Jarrett mentioned that such studies were included in the study documents associated with the proposed (but not constructed) jetties at Oregon Inlet. Jarrett asked about differentiating between the environmental impact of the terminal structure and beach fill as compared to the beach fill that would be necessary (volume and frequency) without the structure. Bedsole reiterated that they wanted to stick to the data and not provide an expert opinion (i.e., what assessments and reports have been completed and what were the findings).

Tschirky continued his discussion on the project work plan and proposed construction techniques for terminal groins and potential construction techniques that could be used (parameters such as length, height, and porosity of structure) in modeling that assess these construction techniques under average storm and wave conditions. Rogers asked if the Panel supported using the Genesis model. Jarrett was concerned that Genesis was not appropriate (it doesn't replicate onshore-offshore transport). Even if Genesis did do a great job, how are the model results going to be used? Jarrett suggested that time would be better spent going through historical reports to see what other models have been run (and what the model results were). Overton paraphrased that the intent of M&N's broad brush approach was to justify a general statement such as "The longer a terminal groin is, the farther down the beach the shoreline impact might be." M&N agreed. Jarrett also suggested that the height of a terminal structure could be used in a model by determining the height necessary to maintain a certain beach profile template. Overton summarized the discussion by stating that the Panel certainly has interest in the topic and is concerned about using Genesis.

Comments were made about the removal of terminal structures. Jarrett stated that structures could be designed for removal if necessary. Rogers felt it was an important point for the CRC to consider – if the structure needed to be removed, could it? Birkemeier liked the idea of reviewing the literature and addressing construction techniques and separating the old from the new techniques.

Chris Dumas was not present to discuss the economic portion of the M&N study so Tschirky reviewed the germane slides. Dumas will be doing a hypothetical economic impact not based on a specific NC inlet but based on a hypothetical inlet with average values. Rogers noted that the inlet hazard area data (and the proposed IHA boxes) are available for us in this study to point out the areas that are more vulnerable to inlet processes. From these data, it can be identified what is at risk. Additional setback studies from the Science Panel subcommittee could also be used to identify the higher hazard areas within the proposed IHA boxes. Rogers said that one scenario is that the terminal groin would be perfect and would save everything adjacent to an inlet (so the

on-the-ground tax data could be used). M&N noted that Dumas would not use a specific inlet or inlets and Rogers was suggesting using the inlet-specific data. Rogers was comfortable saying that the Science Panel inlet hazard and subhazard zones could show what is at risk but may not show what a terminal groin may or may not protect.

Johnny Martin felt that Dumas was going to look at specific inlets but create an aggregate dataset to create an average case rather than break out each inlet separately. It was noted that the scope of work on this portion of the project might be reduced to 30 years instead of 50 (30 was used as a management window in the Science Panel's inlet hazard discussions). Rogers suggested looking at three scenarios: 1) at risk today, 2) at risk with full buildout, and 3) no loss (i.e., assumption that nothing falls in the water and the terminal groin works flawlessly but also includes cost of construction and maintenance and beach fill associated with terminal groin). The question arose if a 30-year timeframe was appropriate for this project. Riggs also pointed out that sea level rise should be considered within the terminal groin project. Overall, the Panel was concerned at how sea level rise would be modeled in the economic study. Maybe the Binn study could be distributed to the Panel? Maybe Dumas could speak to these issues at the next Panel meeting?

The fifth task of the project is initial construction and maintenance costs. Available data will be reviewed for the five sites chosen earlier in the meeting. Also develop ranges of potential costs based on typical expected terminal groin dimensions and geometries based on coastal processes (e.g., wave heights, tidal volumes and elevations) and coastal environments (e.g., slopes and depths) expected in North Carolina. The cost of nourishment, if it is tied in with the terminal groin, will be included in the maintenance cost. The question was posed as to whether monitoring and mitigation would be included (as well as permitting) in the total costs.

The sixth task deals with potential terminal groin locations. The sense of the Panel was to consider locations only at inlets rather than the ends of non-inlet littoral cells. This was certainly the case when choosing the study sites of existing terminal groin structures. An additional question, should these structures be limited to only inlets with dredged navigation channels versus inlets that are not dredged for navigation. This task will not recommend specific sites. Gregson suggested looking at the question from two different angles. The first angle would be to consider terminal groins at navigable and dredged inlets to trap sand and keep it out of the inlet, and the other angle would be to consider terminal groins because the inlet is already impacted by dredging for navigation. The other way to look at it is should you putting them at an inlet where there is no plan or effort to keep an inlet managed by dredging of channel or realignment of channel (i.e., if you're not going to do the latter, should you be doing the former)?

The Panel discussed the timing of the next meeting. Overton commented that the sooner the Panel could reconvene to discuss these issues the better. Maybe the end of October? It was suggested that a portion of the sea level rise meeting on October 26<sup>th</sup> and 27<sup>th</sup> in Morehead City could be devoted to the Panel's discussion with M&N on the terminal groin study. Rogers also commented that the inlet study should also be discussed and

finalized amongst the Panel in order to assist Dumas and the economic study regarding inlets. Overton commented it might be too ambitious to discuss all three of these items at the sea level rise meeting. Overton asked Warren to coordinate scheduling of another meeting date (maybe in November) via email when everyone could access their calendars. Gregson commented that it might be an issue using the proposed IHA boxes and Science Panel setback lines because they have not been adopted by the CRC. Rogers wondered if the sandbag records would be a good proxy for identifying currently at-risk structures? Overton hoped that Dumas could attend the next meeting. Jarrett noted that the proposed IHA boxes cover a large area that is influenced by the inlet but may not be affected by a terminal groin (i.e., these shoreline reaches may not reflect the shoreline affected by a terminal groin).

Overton adjourned the meeting at 3:05.