The Feasibility of Further Dredging of the Cape Fear River

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Prepared for Save the Cape, Inc.

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The Feasibility of Further Dredging of the Cape Fear River

If you find yourself in a hole, the first thing to do is stop digging.
–Will Rogers

Summary

The Wilmington District of the US Army Corps of Engineers has commenced a feasibility study of modifications to the channel in the Cape Fear River, called by the Corps the “Wilmington Harbor.” This followed a letter of intent by the Secretary of the North Carolina Department of Environment and Natural Resources to share the cost, and a “Section 905(b) Analysis” by the Wilmington District to determine whether there was a “Federal interest” in the project. This presents the results of a preliminary investigation of the issues the letter of intent and the Section 905(b) Analysis identified for study:

- Modifications to the alignment within the Bald Head portion.
- Modifications to the turn within the Battery Island portion.
- Modifications to the size of the existing turning and anchorage basin at the Port of Wilmington.

The Channel at Bald Head Island. The channel at the river entrance at Bald Head Island is subject to rapid and persistent shoaling, resulting in limits to vessel draft, erosion of beaches, and a requirement for obtaining dredging funds from a stingy Congress annually. The only solution with any promise is reevaluation of the economics of maintaining the channel, and selecting an optimal, shallower depth at which transportation benefits exceed maintenance costs. To the extent that the Military Ocean Terminal at Sunny Point requires a deeper channel than commerce justifies, that cost should be shifted to the defense budget.

The Turn at Battery Island. The channel turn at Battery Island presents difficulties for the larger vessels now navigating the Cape Fear River. That turn does not comply with Corps of Engineers or international standards for channel turns for those vessels, and the configuration of the river at that point prevents modification of the channel sufficient to achieve such conformance. Transit of that turn by larger vessels should not be considered. Transit of that turn by existing vessels should be reconsidered.

The Turning and Anchorage Basin at the Port of Wilmington. The turning basin at the Port of Wilmington is subject to shoaling, and the largest vessels calling at the Port can only be turned around under limited conditions of tide. The turning basin is already as wide as the river; enlarging the turning basin would involve excavation of rock, loss of 28 acres of primary marine nursery area and nine more acres of other habitat, and penetration of land now contaminated with PCP and other toxic materials.
A wider turning basin would have limited utility: larger vessels could not reach the Port of Wilmington because of the sharp turn at Battery Island.

All of these problems illustrate that the Cape Fear River has no capacity for deeper-draft vessels, and indeed cannot safely or efficiently accommodate the vessels now calling. The river is not a deep-water harbor, and efforts to make it so are not only a poor use of economic resources but are destructive of natural resources.

The “Section 905(b) Analysis” prepared by the Wilmington District of the US Army Corps of Engineers to determine whether a feasibility study should be conducted contains many flaws, the most notable of which is the analysis of benefits and costs which has been rigged to show a surplus of benefits over costs. The report also includes as an alternative the dredging related to the planned North Carolina International Terminal, a project specifically excluded from the Secretary of the Department of Environment and Natural Resources. The analysis of benefits and costs for that alternative is also rigged to show a surplus of benefits over costs—by including “capture” of container traffic from other ports. That is specifically prohibited by law.

The alternative not considered in the Section 905(b) Analysis, which should be considered, is restoration of the river channel to its former depth of 38 feet, which prevailed from 1973 to 2004. That would result in savings in the cost of maintenance dredging (compared to the cost of dredging that should be done for the 42-foot depth, but is not), and when considered on a national basis, would provide savings in transportation costs. That depth is sufficient for the Military Ocean Terminal at Sunny Point, and suggests that the Department of Defense should participate in the cost of maintenance of that depth. The problem of beach erosion at Bald Head should be attenuated, although the amount is unpredictable.

The Wilmington District of the Corps of Engineers recommended a feasibility study for this project, although in cases involving issues covered in a previous study (which these are) Corps regulations and practice require use of a different format, a general reevaluation report. Such a report, related to the Wilmington Harbor improvement project commenced in 1998 and still underway, was begun in 2005 but stopped in 2009. The share of the costs to be borne by the State of North Carolina as the “non-Federal sponsor” in a general reevaluation report would be substantially less than for the new feasibility study, 35% instead of 50%. Economic and environmental problems with the existing project would also be disclosed.

The Section 905(b) Analysis is a modification of the analysis for the North Carolina International Terminal begun in 2009. The authorization was deemed adequate to change the scope of the analysis to the minor improvements in the Cape Fear River channel contemplated by the Secretary of NCDENR’s letter of intent, and funds originally authorized for the NCIT analysis were redirected. Use of the feasibility study format instead of a general reevaluation report would facilitate later redirection back to the NCIT project. Indeed, the Section 905(b) Analysis including the analysis of the NCIT is the basis of the study cost-sharing agreement.
The Proposed Wilmington Harbor Improvements

On December 7, 2010, Dee Freeman, Secretary of the North Carolina Department of Environment and Natural Resources, sent a letter to the District Engineer of the Wilmington District of the US Army Corps of Engineers stating that the State intends to share the costs of a study of modifications to the channel in the Cape Fear River “to retain existing vessel calls as well as accommodate slightly larger vessels.” The letter identified three projects to be examined closely:

- Modifications to the alignment within the Bald Head portion.
- Modifications to the turn within the Battery Island portion.
- Modifications to the size of the existing turning and anchorage basin at the Port of Wilmington.

No further description of the scope of the study was provided or appears in NCDENR public records. There is not any indication of what is meant by “slightly larger vessels.” No estimate of the cost was provided in the letter of intent.

In April 2011, the Wilmington District of the US Army Corps of Engineers released a report entitled “Section 905(b) Analysis, Wilmington Harbor Navigation Improvements, New Hanover and Brunswick Counties, North Carolina.” That report provides preliminary costs, benefits, and environmental impacts of those three projects, and includes a recommendation to proceed to a full feasibility study of those projects.

The report also includes investigation of two alternatives:

- **NCIT.** A combination of substantial deepening of the lower reaches of the channel and construction of a channel extension, turning basin and berthing area for the proposed North Carolina International Terminal, a very large marine container terminal planned for Southport near the mouth of the Cape Fear River.

- **No Action.** Continued maintenance of the existing channel and completion of the current project to deepen the channel to 42 feet.

The Section 905(b) Analysis estimated the cost of the feasibility study at $5.3 million, of which $2.5 million would be for the account of the “non-Federal sponsor,” the State of North Carolina.

On April 25, 2012, the Secretary of the North Carolina Department of Environment and Natural Resources signed an agreement to share approximately one-half of the study cost. The cost was projected to be $4,600,000; the State share was projected to be $1,927,000; both are subject to change. On the basis of that agreement, the Wilmington District has commenced the feasibility study contemplated by the Section 905(b) Analysis.
The Channel in the Cape Fear River

The channel in the Cape Fear River is about 26 miles from the river mouth to Wilmington harbor. Because the continental shelf falls off gradually at the Cape Fear, the dredged channel extends about six and a half miles beyond the river mouth.

The channel has been maintained at a depth of 42 feet since being dredged to that depth in 2004. However, when first measured in Colonial times the depth of the river in the natural channel was about sixteen feet; the entrance to the river over the bar was about twelve feet deep. In 1761, a storm created an opening to the ocean about eight miles north of the Cape Fear, which led to shoaling of the river channel and the ocean bar at the mouth of the river. That inlet, called “New Inlet,” became an alternate channel entrance used by shallow-draft blockade runners to reach Wilmington during the Civil War. The shallowness of the river and its entrances was the defense against Union gunboats, establishing Wilmington as the “lifeline of the Confederacy” until early 1865. In the 1870’s the US Army Corps of Engineers blocked New Inlet in case the South should rise again. Thereafter, all vessel traffic for the port at Wilmington used the main channel through the mouth of the river at the Cape Fear.

The Corps has increased the depth and width of the main channel in a succession of projects. During the Second World War the channel to Wilmington was maintained at a depth of 30 feet. In 1956-1958, to accommodate the new Military Ocean Terminal at Sunny Point, the channel was dredged to 34 feet, and the entrance to the river channel at Bald Head was deepened to 35 feet. In 1971-1973, the depth of the channel to Wilmington was increased to 38 feet. A depth of 40 feet at the ocean bar was planned but not accomplished.

In 1998, the Corps received authorization and funding to increase the channel depth to 42 feet in the river, 44 feet at the ocean entrance. That project is still in progress, although the channel was opened at the new depth in 2004.
The Current Wilmington Harbor Project

The Wilmington District of the Corps of Engineers is in the 14th year of construction of the Wilmington Harbor Improvement Project, a project to deepen the channel in the Cape Fear River from 38 to 42 feet. The project traces its ancestry to authorization in the Water Resources Development Act of 1986. Current plans call for completion in 2014, depending on the availability of funds.

The feasibility study and the environmental impact statement were started in 1992 and completed in 1996. Construction of the project began in 1998; the channel was opened at the deeper depth in 2004, but the environmental mitigation parts of the project were deferred and some remain to be funded and constructed.

The cost of the feasibility study and environmental impact statement are not apparent in the record. The feasibility study estimated the project cost at $250 million, and on that basis determined that the benefits would exceed costs in a ratio of 1.2 to 1.

When design work commenced, the Wilmington District determined that there would be cost savings from realignment of the channel at the ocean bar, where the river meets the sea between Bald Head Island and Caswell Beach. The realignment involved moving the lower reaches of the channel, beyond the river mouth, to the east to avoid rock formations. An environmental assessment of modifications of the plan was made in 2000 (but not a complete environmental impact statement), and the modifications were adopted.

In 2009, the Wilmington District estimated the cost to complete the project at $533 million. The channel had been opened at the new depth of 42 feet in 2004, but much of the environmental mitigation had not been done. Some parts of the project have since been abandoned. In July 2011, NCDENR reported the current estimate to complete the project to be about $384 million.

The cost to July 2011 was $317,548,550. Of that, the State share is 35%, approximately $111 million. Federal law permits 10% of the cost of the project to be deferred by the State. The State has so far contributed $73,995,550; approximately $37 million remains owed by the State to the Federal government for project costs to date.

The cost to complete the project was estimated in July 2011 to be $67 million. The State share of the work to be done, after repayment of deferred amounts, would be $23.5 million. The aggregate balance for account of the State to the completion of the project is thus $60.5 million.

This would bring the total cost of the Wilmington Harbor Project to $384 million. The State share, ultimately, would be $134.4 million.
In 2005, a general reevaluation report was begun to address environmental mitigation and other issues that had arisen. In 2007, the project team determined that peer review would not be required, and that decision was approved by the South Atlantic Division. In early 2009, the general reevaluation report process stopped, and has not been resumed.

The benefit/cost ratio has not been recalculated to take into account actual benefits or costs. The Corps determines the benefit/cost ratio on an average annual basis. The construction cost is amortized over 50 years at the then prevailing interest rate of government bonds, and annual benefits are discounted to present value. Interest rates have come down considerably since the ratio was calculated in 1998. Reduction in rates reduces the annual cost of the construction and increases the present value of future benefits.

It is difficult to count the project a success. In 2009, the last year reported by the Corps of Engineers, 97 vessels with drafts greater than 35 feet called at the State Port and the private facilities at Wilmington—less than two a week. The annual cost of construction of the project over 50 years at 5% would be $21 million. The Corps budget for maintenance dredging is about $12.6 million per year, of that, the amount attributable to the greater depth and length of the 42-foot channel is about $6 million, for $27 million. That represents $278,000 per vessel call.

Container traffic has increased considerably since the channel was opened at the deeper depth in 2004. Allocating 90% of the cost of the project to container traffic (about ten deep-draft vessel calls per year are tankers), and taking into account that about 70% of the Port of Wilmington 154,000 container movements are from the deep-draft vessels of the CKYH group, each container handled by those ships can be allocated $225 of the cost of the project. Considering only operating costs, the marginal profit for the State Ports Authority is about $16 per container. Thus the taxpayers provide a subsidy of $209 per container.

The Corps of Engineers is having difficulty maintaining the channel at the new depth. Shoaling is persistent, particularly at the turning basin at Wilmington and at the channel through the ocean bar at the mouth of the river. An annual budget of $12.6 million is required for maintenance dredging, and Congress does not always provide that. In the current state of a stingy Congress, the channel is rarely available at the full authorized depth of 42 feet, and the pilots must impose draft restrictions and use the tides to traverse the channel to Wilmington.
The Channel Alignment at Bald Head

The first two projects planned for the feasibility study relate to problems with an S-curve in the channel in the lower portion of the river. This chart excerpt shows the Cape Fear River channel with that S-curve where, coming downriver, it turns sharply around Battery Island and then reverses direction to pass West Beach on Bald Head Island to the ocean. (Bald Head Island is in the lower right corner of the chart.)

At the mouth of the Cape Fear River, early charts show two natural channels—one on each side of the river mouth, separated by Jay Bird Shoals. The natural depth of each was in the range of 12-16 feet. When the “New Inlet” upriver near the site of Fort Fisher was closed after the Civil War, the channel on the eastern side, near Bald Head Island, was chosen as the main navigation channel.

The 42-foot deep channel created in the period 2001-2004 has proven susceptible to rapid and persistent shoaling, attributed to beach sand being interrupted in its natural drift along the shore and being captured by the channel instead of moving to the next beach. The sand must be dredged out of the channel and placed back on the beaches constantly—and perpetually (although the material from the channel is sometimes taken to an offshore disposal area instead of being replaced on the beaches). That shoaling and the related erosion of beaches had been anticipated, and the Corps of Engineers established a plan of maintenance...
dredging at two-year intervals. The sand was to be restored to Bald Head Island in two dredging cycles out of three, the third going to Caswell Beach on the west side of the channel.

Unfortunately, after three dredging events the Federal appropriation for the biennial project was no longer forthcoming, and the Village of Bald Head resorted to its own funding (from homeowners’ taxes) to restore its beaches. In December 2010, the Village brought suit against the Wilmington District of the Corps over the issue of beach erosion related to the channel. That has not been resolved. A Federal appropriation has since been made, and further dredging is planned for fiscal year 2013.

Shoaling and Navigation

In its Section 905(b) Analysis, the Wilmington District of the Corps of Engineers was concerned more with navigation issues than beach erosion. This is the Corps statement of the problem:

Shoaling on the east side of the navigation channel at Baldhead and the resultant reduced width is problematic to navigation under typical wind and tide conditions. This shoaling places vessels on the less advantageous side of the channel to navigate the bend within the Smith Island Channel reach. In order to avoid the shoaling in Baldhead Shoal Channel Reach 1, vessels are required to decrease speeds to navigate the S-shaped useable channel. The issues with this channel have been expressed by the North Carolina State Ports Authority by letter dated 5 October 2010. (Attachment 1). Vessels currently calling at the Port of Wilmington include one of 965 feet in length, and ranging from 4,600 to 4,800 TEU capacity, compared to vessels of 850 feet in length and approximately 3,800 TEU capacity, at the time of prior authorization. Current vessel restrictions are for a 38-foot “anytime” draft (State Port Pilots; COE communication – Feb 2011).

The remedy that the Wilmington District proposed is a realignment of the channel slightly to the west at the turn, The District suggested that “may” reduce shoaling, decrease navigation maintenance costs, and reduce project costs.
Erosion of the Beaches

The rapid shoaling of the navigation channel is a consequence of a much more visible and controversial problem—loss of sand from the beaches into the channel.

Coastal beaches are dynamic. Sand erodes under certain conditions of wind, tide, and storm and is replenished in a complex mechanism. That is understood in general but application of theory to specific locations can be challenging.

In the simplest terms, waves striking the beach at an angle create a current parallel to the shore called the “longshore current.” That carries sand along the beach, so that sand lost from one area is placed on another. Inlets can interrupt that flow; a natural inlet is usually bypassed by the sand moving along the sandbar at the inlet mouth, so it can continue and accrete on the downstream side. But a navigation channel dredged into that bar at an inlet creates a “sediment sink” that captures some of the sand as the river tries to fill and restore itself to its natural configuration. The result is loss of sand on both sides of the inlet, and shoaling of the navigation channel. You can’t fool Mother Nature.

The Cape Fear, Bald Head Island, and the mouth of the Cape Fear River represent an extraordinarily complex system. The inlet, 6,650 feet wide, is the largest river inlet in southeastern North Carolina. The tidal flows and river currents interact with the longshore current, and all of that natural activity has been altered by dredging of the channel over nearly two centuries.

The Cape Fear River inlet is naturally quite shallow, less than twelve feet at the deepest point. In 1871, the channel on the east side was dredged to 12 feet, 100 feet wide. Between 1890 and 1985, the channel was increased to 40 feet deep, 400 feet wide, removing 70 million cubic yards of material out to disposal areas at sea. This large-scale dredging led to segmentation of the tidal delta and an eventual reorganization of the shoal complex into distinct east and west segments. Jay Bird Shoal on the western side of the inlet gained approximately 11 million cubic yards, while Bald Head Shoal on the eastern side, no longer nourished by the eastward longshore current, lost 29 million cubic yards, almost 45% of its volume in 1857, when the natural equilibrium prevailed.

In 1998, the project to further deepen the channel in the Cape Fear River was authorized. Plans specified deepening the channel at the river mouth and seaward to 44 feet, with substantial widening. An analysis of cost of the deepening project in 2000 resulted in a change in the alignment of the seaward extension of the channel, giving it an eastward bend to south-southwest of Bald Head Island to avoid rock formations.

The impact on the beaches from this new project was anticipated by the Wilmington District of the Corps and municipal authorities of the beach communities on both sides of the channel. The larger sediment sink of the enlarged channel would attract sand from the beaches...
at a rapid rate. The District adopted a sand management plan, calling for maintenance dredging every two years, with the sand so removed piped back to the beaches from whence it came, to Bald Head Island Island in two dredging cycles out of three, with the third going to Caswell Beach on the west side of the inlet.

The fatal flaw in this plan is that it must be continued in perpetuity. If it is stopped, the beaches erode and the channel fills. The dredging is expensive (about $6 per cubic yard in the years 2007-2009), and the funds must be appropriated by Congress each time. Also in perpetuity. Congress cannot be depended upon to do that.

The deeper channel was opened to vessel traffic in 2004. As expected, sand from the beaches rapidly moved into the channel, at a rate which has now reached 1.2 million cubic yards per year. The first maintenance dredging was done in 2005. This table shows placement of beach quality sand from the maintenance dredging so far accomplished:

<table>
<thead>
<tr>
<th>Date</th>
<th>Material (Cubic yards)</th>
<th>Placement</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 2005</td>
<td>1,217,500</td>
<td>Bald Head Island</td>
</tr>
<tr>
<td>April 2007</td>
<td>978,500</td>
<td>Bald Head Island</td>
</tr>
<tr>
<td>April 2009</td>
<td>1,064,400</td>
<td>Oak Island/Caswell Beach</td>
</tr>
</tbody>
</table>

The last maintenance cycle occurred in 2009. Congressional funding has not been forthcoming for further maintenance until fiscal year 2013. The Wilmington District of the Corps of Engineers estimates the cost of maintenance dredging for the Cape Fear River channel to be $12.6 million in 2012, growing to $15.7 million in 2017. Most of that is for the entrance channel at Bald Head.

Because the last replenishment of sand at Bald Head occurred in 2007, the Village of Bald Head found it necessary to fund its own project, placing 1.6 million cubic yards of sand on its beaches in 2009-2010.

Erosion continues. As of this writing, sand was moving from beaches on both sides of the inlet into the channel at the rate of 3300 cubic yards per day, and the river pilots have been obliged to limit vessel operations because of shoaling in the channel.
In December 2010, the Village brought suit against the Corps of Engineers, alleging failure of the Corps to fulfill its agreements regarding placement of sand on the Village beaches, which can be summed up in the allegation of “Failure to maintain the shoreline in its condition as it existed on the date of the Corps’s final agency decision approving the Authorized Project."

**Alternatives**

This problem will not be resolved by realignment of the channel. The situation is unstable. The sediment sink would still be there, capturing sand from beaches on both sides of the inlet. These are alternative approaches to the problem:

*Permanent funding.* Annual or biennial funding by Congressional appropriation is unreliable at best, and the current discontent with the system of “earmarks” for specific projects makes this approach unattractive without some sort of permanent funding mechanism.

The Federal Harbor Maintenance Tax. $1.25 per $1000 in value of imports, yields about $2.6 million from traffic at the Port of Wilmington. Although there is a related Harbor Maintenance Trust Fund, that is only a book entry. The money goes into the general fund and can only be spent with Congressional authorization. The system would have to be revised to allocate funds to the harbor where they are earned. But in the case of the Cape Fear, It would be insufficient anyway: the annual receipts would be $10 million less than the annual cost of maintenance dredging. Wilmington is regarded as high-cost, low-use port..

*Restoration.* Shoaling and the need for maintenance dredging is a function of channel depth at the ocean bar, due primarily to the additional length of channel needed to reach deep water. Corps of Engineers records show these historical maintenance dredging volumes:

<table>
<thead>
<tr>
<th>Channel Dimensions</th>
<th>Years Maintained</th>
<th>Average Annual Maintenance Dredging (cy/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 X 100</td>
<td>1871 - 1880</td>
<td>No Records</td>
</tr>
<tr>
<td>16 X 270</td>
<td>1881 - 1891</td>
<td>38,300</td>
</tr>
<tr>
<td>20 X 270</td>
<td>1892 - 1910</td>
<td>202,300</td>
</tr>
<tr>
<td>26 X 400</td>
<td>1911 - 1925</td>
<td>495,800</td>
</tr>
<tr>
<td>30 X 400</td>
<td>1926 - 1948</td>
<td>363,100</td>
</tr>
<tr>
<td>32 X 400</td>
<td>1949 - 1955</td>
<td>584,700</td>
</tr>
<tr>
<td>35 X 400</td>
<td>1956 - 1968</td>
<td>552,000</td>
</tr>
<tr>
<td>40 X 500</td>
<td>1969 - 1987</td>
<td>737,500</td>
</tr>
</tbody>
</table>
In planning for the most recent channel deepening project, the Wilmington District provided these figures in its 1996 report.

<table>
<thead>
<tr>
<th>Depth</th>
<th>Annual Shoaling</th>
</tr>
</thead>
<tbody>
<tr>
<td>34 feet</td>
<td>533,000 cubic yards</td>
</tr>
<tr>
<td>38</td>
<td>735,000</td>
</tr>
<tr>
<td>42</td>
<td>850,000</td>
</tr>
</tbody>
</table>

The figure for 42 feet was an estimate. The most recent experience with the channel, however, is shoaling at the rate of 1.2 million cubic yards per year, suggesting that the relationship of depth to annual shoaling is not linear, and that the current depth is beyond the point that can reasonably be sustained.

A possible solution is to abandon the efforts to maintain the channel depth and permit it to shoal back to a shallower depth, recognizing that the larger ships could no longer call at Wilmington. Other river ports, on the Connecticut, Potomac, James, and other rivers in the East have long since given up trying to serve ocean commerce, letting the vessel traffic move to naturally deep harbors and relying on overland transportation. The incremental cost, if any, of that would have to be weighed against the savings in maintenance dredging for various depths.

In the case of the Cape Fear River, the stated needs of the Military Ocean Terminal at Sunny Point are for a channel to be maintained from that facility to the sea at a depth of 38 feet. If a 38-foot channel cannot be justified for commerce, the cost of maintenance to that depth should be shifted to the Department of Defense. Perhaps the Department of Defense should share the cost anyway.

**Hardened structures.** The Village of Bald Head Island has had some success with sand-filled groins on its beaches, and suggests some sort of hardened structure between the beach and the channel would serve to inhibit erosion. However, this is a very controversial approach, prohibited in North Carolina until the last session of the General Assembly. It falls in the category of “serial engineering,” in which engineered changes in waterways cause unanticipated results that then require further engineered changes.

**Conclusion**

The only solution with any promise is reevaluation of the economics of maintaining the channel, and selecting an optimal shallower depth at which transportation benefits exceed maintenance costs. To the extent that the Military Ocean Terminal at Sunny Point requires a deeper channel than commerce, that cost should be shifted to the defense budget.
The Turn at Battery Island

The other part of the troublesome S-curve in the channel is the turn at Battery Island. Moving downriver, this has a 65-degree turn to port immediately followed by a 30-degree turn, resulting in a 95-degree change of direction for vessels using the channel. This is immediately followed by a reverse turn to starboard to pass through the river mouth at Bald Head Island.

The configuration of the turn at Battery Island does not comply with the Corps of Engineers standards in its Engineering Manual for vessels of the size for which the existing channel was designed—“Panamax” vessels of 965-foot length and 106-foot beam, nor does it comply with international standards for such turns. The problems with this configuration are addressed in a recent Corps of Engineers report, the Wilmington Harbor Initial Appraisal (“section 216 report’) dated July 2010:

This turn is problematic for certain container vessels under specific conditions of wind and tide. These particular vessels are being forced to delay their transit and await favorable tide conditions in order to serve the harbor. These delays are expensive and result in increased transportation costs. Certain vessels are being subject to draft restrictions as a result of this turn (see Attachment 1). Contributing factors influencing safe maneuvering of these ships through the channel include the ship handling characteristics and size, channel configuration, tide conditions, and inbound or outbound transit operation. The handling characteristics of certain companies' container ships are less responsive than other container ships of the same class. Turning these ships is challenging due to the dimensions of the turn and the adjacent channels. Battery Island Channel is 2,589 feet long with a 30 degree, 36 minute turn angle at the southern end and a 65 degree, 3 minute turn angle at the northern end. Given the dimensions of the channel and a combined north and south turning maneuver of 95 degree, 39 minute, safely navigating these ships through the Battery Island Channel, and the turns at either end, is an extremely complex maneuver. Strong ebb and flood tidal currents significantly affect ship maneuverability. The most difficult transit of the Battery Island Channel occurs when a ship is inbound with a maximum ebb tide current. These issues have resulted in vessel delays and issues of vessel safety in serving the Port of Wilmington.

This has been a persistent problem, the subject of concern by the river pilots who are compelled to limit passage of certain vessels to flood tide. The pilots must use the limits of maneuverability to negotiate the turn, and may be using areas outside of the turn that the river has scoured to a depth equal to the channel. In 2005, the Lijnbaansgracht was involved in a grounding incident when moving downriver.
Mr. Thomas J. Eagar  
Chief Executive Officer  
North Carolina State Ports Authority  
2202 Burnett Boulevard  
P. O. Box 9002  
Wilmington, NC 28402  

Routad: 30 June 2008 (Aur)  
Action: Operations  
Suspense: FYI  
C/F: DE, DD, DP, DX, PM

Dear Mr. Eagar:

Representatives from the Wilmington - Cape Fear Pilots Association recently met with representatives of the Wilmington District Army Corps of Engineers to discuss upcoming maintenance dredging projects and possible future channel improvements. As you may be aware, the pilots currently restrict certain Yang Ming vessels to a 36-06 anytime draft upon arrival. The reason for this is the difficulty with certain vessels negotiating the turn at Battery Island on an ebb current. These vessels that are deeper than 36-06 are moved on a flood current only.

The pilots have suggested to the Army Corps a possible solution to the above problem. It is thought that increasing the width and length of the widener between buoys 16 and 19 may improve the turn at Battery Island sufficiently to allow the above draft restrictions to be removed.

To facilitate this improvement, the pilots request the support of the State Ports Authority in a matter that will be a benefit for current and future port customers. In addition, the pilots would be pleased to meet with you and anyone you may designate to discuss this in more detail.

Thank you for your consideration in this matter.

Yours sincerely,

[Signature]

Stephen M. Phillips  
President

cc: Colonel John Pulliam
This is not a new problem. The 1998 channel deepening was intended to accommodate the largest vessel able to transit the Panama Canal. The issue of the channel turn for such vessels was recognized, although not addressed. In Appendix D, Engineering and Design, to the Record of Decision released for that project in 1996, the Wilmington District compared the turns to the recently released criteria for channel turns in the Corps of Engineers Engineering Manual 1110-2-1613:

Some of the turns did not fit the new criteria as far as the combinations of turn deflection angle and ratio of turn radius to ship length. It was decided that the authorized turn designs were adequate at this time. The turn widths will be studied during preparation of the plans and specifications as part of the ship simulation model.

Simulation Studies

After the project was authorized, the Corps of Engineers arranged for tests to be conducted at a private ship simulator, the Raymond T. McKay Simulation Training and Research Center at Dania, Florida, in 1999. The facility has a full-size mockup of a ship’s bridge, and the ability to simulate response of a vessel in a programmed channel configuration under various conditions of current.

Test runs were conducted for a “design vessel” of 950 feet overall length and 106-foot beam, drawing 38 or 42 feet, in both ebb and flood tides. In all runs, five for each test condition, the vessels left the marked channel. Although in a few runs grounding would have occurred, most were without incident because the simulation included the areas of deep water scoured by currents on the outside of the marked channel at the turns, providing extra space.

At the suggestion of the pilots conducting the tests, a widener was added to the apex of the turn between Bald Head Shoal and Smith Island Range. Otherwise, the dredging project proceeded with the original design of the channel configuration.

This issue was not addressed in a later report, an Environmental Assessment issued by the Wilmington District in February 2000 for modifications of the alignment of the offshore part of the channel. The general reevaluation report initiated after the deeper channel was opened should have addressed the issue, but that effort stopped without explanation in 2009.

In 2011, Moffatt & Nichol revisited the issue in the NCSPA Port Business Case Project prepared for the North Carolina State Ports Authority. Using ship simulation software developed by Maritime Research Institute Netherlands, Moffatt & Nichol tested an existing container ship of the type currently calling at the Port of Wilmington (950 foot length, 106 foot beam) and a future vessel with a capacity of 8000 twenty-foot equivalent units (TEU), 1043 foot length and 140-foot beam. Tests were run inbound and outbound,
with and without wind and tide. In the simulation, the larger vessel was obliged to follow a path 264 feet outside of the channel boundary at the apex of the turn. In all cases, the vessels reached or breached the boundaries of the channel. Moffatt & Nichol reported that “The SHIPMA numerical modeling tool indicates that the existing channel alignment at the Battery Island Reach is not satisfactory to safely transit an 8,000 TEU vessel.”

The Wilmington District’s Proposal

In order to improve the situation for existing vessels, the Wilmington District of the Corps of Engineers proposes a “widener” inside the apex of the turn.

However, the District acknowledges the potential for erosion at Battery Island, an important white ibis rookery. The District also reports that the project would likely affect underwater cultural resources. They do not identify the “underwater cultural resources,” but the proposed widener would be close to the wreck of the CSS North Carolina, one of two ironclads built during the Civil War in Wilmington. That has already been damaged by dredging activities. In 1995, a 15,000 pound anchor was dropped on the bow of the CSS North Carolina to serve as a mooring for barges supporting dredging operations. It was later pulled out through the hull, resulting in the damage shown in this illustration.

The proposed widener would be, at best, an inadequate remedy for a larger problem, long ignored: A channel conforming to the recommendations and standards for width and

![FIGURE 8. Plan of the bow of the ironclad CSS North Carolina illustrating the damage done by anchoring in the wreck (Image courtesy of Tidewater Atlantic Research, Inc.).]
turns–either of the Corps of Engineers or the Permanent International Association of Navigation Congresses (PIANC)–cannot be fit between the banks of the Cape Fear River.

This is demonstrated by the line on this chart, which represents the centerline of a channel conforming to Corps recommendations for turn radius to accommodate vessels currently calling at Wilmington–Panamax vessels of 960-foot length. But this line does not have a transition zone between reverse curves–a straight section of five times vessel length is recommended by the Corps of Engineers manual to permit a ship to stabilize before entering the next turn.

In a visit with the Chief of Planning of the Corps in Washington, this issue was brought up. After perusing the map and tracing the line with his finger into the area now occupied by the City of Southport, the Chief’s response was: “We’ll just have to buy some land.”
The limitations of the Cape Fear River were recognized by CH2M Hill, Inc., the engineering firm doing the preliminary studies for the proposed North Carolina International Terminal, which would handle larger ships. In the firm’s *Conceptual Dredging Study*, provided to the State Ports Authority in 2008, the matter of the channel turn was addressed:

A recent engineering manual (USACE EM 1110-2-1613, Hydraulic Design of Deep Draft Navigation Projects, Chapter 8 – Channel Width, 2006 – APPENDIX B) was used as the basis for the channel width and channel curves. One-way ship traffic was the design criterion for determining channel width. The existing channel into the Cape Fear River has a dramatic “S” curve in the first 4 miles inside the inlet. Once a ship passes through Baldhead and Jaybird Shoals, it makes a 45-degree turn to port, immediately followed by a 105-degree turn to starboard around Battery Island, before straightening into the channel reach known as the Lower Swash Channel and heading upriver. This area is known to have a high current state on both the incoming and falling tide. Multiple attempts were made to design a channel that followed the existing course; however, it was found that the standards in Chapter 8 of the manual (USACE, 2006) could not be met without causing obvious impacts at the east end of Caswell Beach or the riverfront at Southport.

Another consulting team, TEC Inc. and PF Richardson Associates, engaged to find ways to reduce the cost of the planned container terminal, reached the same conclusion:

With assistance from Gahagan and Bryant Associates, Inc.(GBA) and references to USACE Channel Width Design Manual, it was concluded that this alignment did not meet USACE design standards and there were no viable modifications that could be performed to meet these standards.

And:

According to USACE Engineering Manual EM 1110-2-1613, reverse turns (S-bends) require a straight segment at least five times the design ship length between successive turns. This is not possible to accomplish within the confines of the existing waterway.
The firms’ collective recommendation was for a new channel alignment, passing east of Battery Island and by-passing the S-curve. That is shown below (red):

This conclusion was not reached without some concern. The proposed route would be through undisturbed areas with depths measured in single digits. The additional dredging involved would be much more expensive than simply enlarging the existing channel. That portion of the river is part of the John H. Chaffee Coastal Barrier Resource System, a Federal reserve, and the Bald Head Island Natural Area, a State reserve. There would be significant implications for environmental effects from loss of habitat and the increase in tidal amplitude that would result from creating this large, direct path up the river.

**Prudent Practice**

There is a difference between what is possible and what is prudent. The design guide of the Permanent International Association of Navigation Congresses (PIANC) and the International Association of Ports and Harbors (IAPH) is more comprehensive than the Corps of Engineers manual, taking into account many factors and explaining the rationale in some detail. The PIANC guidelines offer this advice:

- Vessel maneuverability diminishes with channel depth. Although a vessel with good maneuverability may be able to execute a hard-over turn with a radius of two to three times vessel length in deep water, that radius increases to about five times vessel length in a shallow channel with a depth to vessel draft ratio of 1.1 (a depth of 44 feet for a vessel draft of 40 feet).

- Designing a channel turn for hard-over turns is inadvisable. Designing for no more than 20% rudder is recommended to provide a margin of safety. For a water depth to draft ratio of 1.1, the recommended radius at 20% rudder angle is 8.5 times vessel length.

- Bank interaction, a phenomenon that causes the stern of the vessel to be drawn to the side of a dredged channel and results in instability, must be taken into account in determining channel width.
The channel turn from Battery Island Channel to Lower Swash is far sharper than the radius recommended by PIANC. Some vessels must use the limits of maneuverability, rudder hard over, in this area, which PIANC does not recommend.

In a recent paper presented to the New York Metropolitan Section of the Society of Naval Architects and Marine Engineers, the authors, staff members of the Naval Academy, the Coast Guard, and the Maritime Administration, pointed out that as vessel size has increased, channels have been dredged deeper, but not wider, and maneuverability issues have not been adequately addressed. This is a particular problem with container ships. The authors identified these problems with newer generations of such ships:

- Container ships have large windage that can complicate ship controllability in narrow channels as well as during slow speed maneuvering;
- Increases in service speeds may also increase the bare steerage speed. Direct-drive diesel ships with high installed power to achieve design service speeds can, in some cases, have a minimum bare steerage speed of about 8 knots — quite a high speed in confined waters;
- Even the largest container ships usually have single screws, a maneuvering handicap.
- There is a trend to smaller rudders. While such rudders may be adequate at service speeds in open water, maneuverability in confined waters at low speed is compromised.
- Marine architects are taking advantage of the beam increases that will be possible with the opening of new locks in the Panama Canal to decrease the ratio of vessel length to beam, which improves load capacity without increasing draft. However, decreasing that ratio also decreases directional stability. Although this makes it easier to initiate a turn, it also makes it more difficult to check a turn.

Thus while the inadequacies of the channel in the Cape Fear River and the difficulties of maneuvering large container ships so far have been overcome by skillful piloting, this conflict should not be exacerbated by opening this channel to even larger vessels.

**Conclusion**

The Cape Fear River cannot accommodate larger vessels than now call at Wilmington, even with channel modifications. Continued passage by the largest of the vessels currently calling violates the recommended practice of the Corps of Engineers and international standards. This situation presents a risk that cannot be ignored—or inadequately addressed.
The Turning and Anchorage Basin at the Port of Wilmington

The NCDENR letter of intent for cost sharing of the feasibility study includes the item: “Modifications to the size of the existing turning and anchorage basin at the Port of Wilmington.”

The chart excerpt on the right shows the existing turning and anchorage basin upriver from the facilities at the Port of Wilmington, where the Cape Fear River is at its widest in this area. This basin was deepened to 42 feet in the recent Wilmington Harbor dredging project. It is 1200 feet wide in the widest section, approximately the width of the river.

The 1200-foot width is intended to accommodate the design vessel for the project, a ship 960 feet long. Twelve hundred feet is 1.25 times the vessel length, the minimum; 1.5 times vessel length is regarded as desirable. Because the basin is at the minimum width, shoaling from silt moving downriver and accumulating at the sides of the basin reduces the effective width and limits vessel movement. The Wilmington District of the Corps of Engineers, in its Section 905(b) Analysis, reports:

Current anchorage (turning) basin dimensions are not adequate to properly accommodate turning of some of the larger container vessels currently calling at the North Carolina State Ports Authority. Concerns regarding these turning basin dimensions have been expressed by the North Carolina States Ports Authority and the shipping industry. This is also documented in Attachment 2. Currently vessels are being turned on high tides, executing turning more slowly than normal, and engaging extra tug assistance to perform turning maneuvers.

Attachment 2 of the Section 905(b) Analysis is a letter from Yang Ming America Corp., the operator of Panamax container ships calling at Wilmington, advising that “The current width of the turning (anchorage) basin is below standards required for the larger container vessels currently calling the NCSPA.” (NCSPA is North Carolina State Ports Authority, the operator of the port.)

There is little opportunity to increase the size of the turning basin in Wilmington Harbor. As it is, it fills the available space. Any dredging project near the river banks must
take into account the necessity for sloping sides, having a ratio of three feet laterally for every foot of depth. For 42 feet with an overdredge of two feet, 152 feet must be allowed on each side of the nominal width of the basin, unless the sides of the basin are hardened walls. The last few feet of depth of any expansion must be cut into rock.

The Wilmington District of the Corps of Engineers proposes extending the anchorage and turning basin upriver, where they find slightly more room.

![Diagram of the basin](image)

This is the explanation.

A potential alternative measure shown in Figure 3 could increase the dimensions of the turning basin from the existing 950-foot length x 1,200-foot width to a 1,450-foot length x 1,450-foot width. This measure would shift the turning area upstream. The turning area could be centered between the Chevron Terminal and the Hess Terminal to avoid the terminal berth areas. The slight upstream shift of the turning area would also allow for widening that avoids the Eagle Island Disposal Area dikes. This would allow a greater safety clearance for existing Panamax vessels and allow longer vessels to call the NCSPA terminal. This measure might not be sufficient to accommodate all post-Panamax vessels, however.

The Wilmington District notes that expansion to the west (the upper part in the illustration) would remove 28 acres of primary nursery areas (13.3 acres of marsh, 9.6 acres of shallow-water habitat, and 5.1 acres of deep-water habitat) and another nine acres of habitat.
The expansion to the east (the lower part in the illustration) would involve penetration of a site contaminated with pentachlorophenol (PCP), creosote, and dioxins.

The Wilmington District does not offer an explanation of how the ships requiring the larger turning basin would get up the river past the Battery Island turn. However, because shoaling tends to occur at the sides of the turning basin, a larger turning basin would permit longer periods between dredging to maintain adequate clearance for the current generation of vessels.

**Conclusion**

The turning basin at the Port of Wilmington is subject to shoaling, and the largest vessels calling at the Port can only be turned around under limited conditions of tide. The turning basin is already as wide as the river; enlarging the turning basin would involve excavation of rock, loss of 37 acres of habitat (including 28 acres of primary marine nursery area), and penetration of land now contaminated with PCP and other toxic materials.

A wider turning basin would have limited utility: larger vessels could not reach the Port of Wilmington because of the sharp turn at Battery Island.
Economic Analysis

The Section 905(b) Analysis leading to the Wilmington Harbor Improvements feasibility study is mandated by section 905(b) of the Water Resources Development Act of 1986. That requires the Corps of Engineers to perform a “reconnaissance study …to determine whether or not planning to develop a project should proceed to the preparation of a feasibility report.” Section 905(b) further requires “a preliminary analysis of the Federal interest, costs, benefits, and environmental impacts of such project…” The term “Federal interest” is not defined, but in practice is based on the benefit/cost analysis. Thus unless the Wilmington District can show that the benefits of the project exceed costs, the project cannot go forward.

The hurdle is higher than a simple benefit/cost ratio of more than 1.0, that is, benefits just exceeding costs. That was sufficient in 1998—the original channel deepening went forward on the basis of a benefit/cost ratio of 1.2. It is not sufficient now. Corps projects must compete with each other and other agency projects to receive scarce Federal dollars, and the current threshold for projects to be considered is a benefit/cost ratio of 3.0. Alas, that has led to widespread manipulation of the calculations, which apparently are accepted without review or verification.

In its Section 905(b) Analysis, the Wilmington District of the Corps estimates the cost of the three minor improvements to Wilmington Harbor at $41.1 million. Over a 50-year lifetime, that represents an average annual cost of $2,450,000. To be considered for funding, average annual benefits of $7,350,000 must be shown.

The Wilmington District was equal to the task. Corps practice is to calculate benefits of a project based on anticipated transportation cost savings of the improvements. For the three minor improvements, the Wilmington District bases its benefit calculations on the use of post-Panamax vessels loaded to less than capacity in order to reduce draft to less than 42-feet. The District does not specify the size of the vessels, but by definition, a “post-Panamax” vessel is larger than the largest of those now calling at Wilmington, which are called “Panamax,” the largest that can fit through the Panama Canal today.

The calculations are not fully set out in the report. The District determined that the use of light-loaded post-Panamax vessels (of unspecified size) would save $16.80 per twenty-foot equivalent unit (TEU) of containers. The average annual benefits from that are stated to be $9,750,000. For this analysis, the District presumes all three problems will be solved, and treats them in a single calculation.

To achieve average annual benefits of $9,750,000 at $16.80 per TEU, 580,000 TEU would have to be carried in light-loaded post-Panamax vessels. Earlier in the Section 905(b) analysis, the District states the capacity of the container terminal at the Port of Wilmington to be 300,000 TEU annually. That means the claimed benefits are impossible. The District does state that the capacity can be increased, but does not speculate as to the amount of such increase.
nor does the District provide an estimate of the cost. We note that the Port of Wilmington has never handled 300,000 TEU in a single year.

The Wilmington District disregards these factors:

- It would not be prudent, practical, or even possible for post-Panamax vessels to navigate the turn at Battery Island, even with the proposed widening.

- The use of a new generation of vessels loaded to less than capacity is inefficient, and the likelihood of a shipping line using assets in that manner when fully-loaded vessels can be sent to Charleston, Norfolk, Baltimore, and Port Elizabeth/Port Newark, New Jersey is remote.

The economic analysis for the alternative considered, the North Carolina International Terminal, the very large container terminal planned for Southport, is also distorted to show a large surplus of benefits over costs. That analysis assumes “capture” of container traffic from other ports to achieve annual container movements of 3,000,000 TEU, which is ten to twelve times the container movements through the Port of Wilmington in its best year and more than any container terminal on the Atlantic coast except the combined terminals at Port Elizabeth and Port Newark, New Jersey. The use of benefits transferred from other ports is not only improper in an analysis that is supposed to have a National perspective, but is expressly prohibited by section 904 of the Water Resources Development Act of 1986. So the benefits counted by the District are not only preposterous but illegal.

Inasmuch as the project involves three separate issues, the correct approach would be separate evaluation:

- (a) If the problem of beach erosion at the river mouth can be attenuated to some extent, savings in maintenance dredging and beach nourishment would be very substantial.

- (b) Any improvement to the channel turn at Battery Island would have some measurable benefit in reduction of delays for tides, but there is no prospect of permitting passage by larger vessels.

- (c) Widening the turning basin at Wilmington would also have measurable benefits in reduction of delays for tides and longer periods between maintenance dredging. There would not be savings for larger vessels—they could not get there.
The Restoration Alternative

The situation in the Cape Fear River suggests that the original deepening project in 1998 was unwise and is unsuccessful. Instead of throwing good money after bad in trying to salvage the project, consideration should be given to restoring the channel in the river to its previous depth of 38 feet, or simply allowing the river to restore itself, which it is demonstrably wont to do.

These factors suggest consideration of restoration:

Federal Policy

The Water Resources Development Act of 2007 directs the Corps to focus its efforts on restoration projects and non-structural solutions. That theme pervades the requirements for new Principles and Guidelines (section 2031) and the draft of those guidelines prepared by the Council on Environmental Quality. Corps recognition of this policy is found in the template for section 905(b) analyses, which identifies ecosystem restoration as a national objective for water resources projects.

The beach erosion issue at the mouth of the river invokes this section of the Water Resources Development Act of 2007.

SEC. 2018. SHORE PROTECTION PROJECTS.
(a) IN GENERAL.—In accordance with the Act of July 3, 1930 (33 U.S.C. 426), and notwithstanding administrative actions, it is the policy of the United States to promote beach nourishment for the purposes of flood damage reduction and hurricane and storm damage reduction and related research that encourage the protection, restoration, and enhancement of sandy beaches, including beach restoration and periodic beach renourishment for a period of 50 years, on a comprehensive and coordinated basis by the Federal Government, States, localities, and private enterprises.
(b) PREFERENCE.—In carrying out the policy under subsection (a), preference shall be given to—
   (1) areas in which there has been a Federal investment of funds for the purposes described in subsection (a); and
   (2) areas with respect to which the need for prevention or mitigation of damage to shores and beaches is attributable to Federal navigation projects or other Federal activities.
(c) APPLICABILITY.—The Secretary shall apply the policy under subsection (a) to each shore protection and beach renourishment project (including shore protection and beach renourishment projects constructed before the date of enactment of this Act).
Economics

The Section 905(b) Analysis used by the Wilmington District to further this project uses as a “base case” for analysis the “do-nothing” alternative of maintaining the channel at its authorized depth of 42 feet. But that is not being done. More often than not, the channel at the ocean bar at Bald Head is only half of its authorized width at the authorized depth. For valid comparison, the do-nothing alternative must include an adequate budget for maintenance dredging sufficient to maintain the authorized depth and width. That is more than has been provided by the Congress in recent years.

The previous channel depth of 38 feet was maintained without substantial difficulty from 1973 through 2004. Savings in maintenance from the “do-nothing” alternative of maintaining the channel at 42 feet would be in excess of $6 million per year.

The cost would be the loss of the river’s availability to Panamax size vessels. Calls at the Port of Wilmington by such vessels are typically two per week. But perhaps there is no cost. The Port of Wilmington is able to attract such vessel calls by offering a container handling rate $30 less than that of the terminals at Charleston, a rate intended to offset the additional land transportation cost of using Wilmington instead of other ports. Should that vessel traffic move to other ports (which it might do anyway–there is no contractual obligation to use Wilmington), the effect would be a loss of approximately $1.7 million in operating profit at Wilmington. But that is a transfer payment, not to be counted in a proper benefit/cost analysis. From a National perspective, the result of the large container vessel traffic moving to other ports would be a reduction in cost—the cost of the overland movements would be less. If we measure those savings by the $30 discount the Port of Wilmington must offer to retain the traffic, the savings in overland transportation would be about $3.2 million.

In addition to the economic benefits in excess of $9 million, there may be environmental benefits. Reduction in the cross section of the channel would reduce tidal amplitude, attenuating the effects of salt-water intrusion upriver and in tidal inlets.

The Port of Wilmington would remain accessible to all but the largest container ships. The recent Maritime Strategy Study sponsored by the North Carolina Department of Transportation suggests that the future of the port lies in bulk cargoes, specialized breakbulk cargoes, and containers, particularly refrigerated containers, serving the agricultural business of eastern North Carolina. Vessels in that service do not require a channel deeper than 38-feet.

The Military Ocean Terminal at Sunny Point requires a 38-foot deep channel. Establishing that as the authorized depth suggests that the Department of Defense should contribute to maintenance.
Study Format

The Wilmington District of the Corps of Engineers and the Secretary of the North Carolina Department of Environment and Natural Resources have initiated the feasibility study under section 905(a) of the Water Resources Development Act of 1986, as if this were a new project.

It is not. The three issues identified for the feasibility study all arise from the Wilmington Harbor Improvement Project authorized and commenced in 1998. That project is not yet complete. The three issues would constitute reanalyses of issues covered in a previously completed study, and as such should be addressed in a general reevaluation report as specified in the Corps of Engineers Engineering Regulation 1105-2-100, Planning Guidance Notebook. Indeed, the Wilmington District of the Corps of Engineers commenced a General Reevaluation Report for the Wilmington Harbor Project in 2005, and included in its scope another turning and anchorage basin in the Cape Fear River above the anchorage basin intended to be studied in the feasibility study contemplated by NCDENR. Progress on that report stopped in 2009.

The cost sharing formulae for general reevaluation reports and feasibility studies are not the same. The costs of feasibility studies are shared equally between the Federal government and the State sponsor (with some costs borne entirely by the Federal government). A general reevaluation report would be part of the authorized project and costs would be shared in the same ratio as that project, 65% Federal and 35% non-Federal. The non-Federal sponsor, the State of North Carolina, would be responsible for 25% of the cost as the study progressed, with 10% of the cost being deferred.

For a feasibility study costing $4.6 million, the amount estimated by the Wilmington District, this table shows the difference in the North Carolina share (assuming the cost can be held to $4.6 million):

<table>
<thead>
<tr>
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<th>Feasibility Study</th>
<th>General Reevaluation</th>
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<tbody>
<tr>
<td></td>
<td>Initial</td>
<td>Final</td>
</tr>
<tr>
<td>Federal share</td>
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<td>$3,450,000</td>
</tr>
<tr>
<td>State share</td>
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</tr>
<tr>
<td>Total</td>
<td>$ 4,600,000</td>
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If the cost of the study is held to $4,600,000, the State would have an immediate saving of $777,000 with the general reevaluation, but would be obliged to reimburse the Federal government $460,000 over 30 years, reducing the final savings to $317,000. However, such feasibility studies are rarely completed within the original cost estimate, and the cost-sharing agreement contemplates increases. Navigation improvement studies usually disclose a plethora
of problems–environmental and otherwise–that require substantial unanticipated analysis and extend the schedule and the costs significantly. The recent study for the Savannah River—which was done as a general reevaluation report–cost $42 million.

A not insignificant aspect of the general reevaluation report is that it should include review of the economic and environmental aspects of the channel deepening project, as well as the functional flaws. It would also avoid the temptation to redirect the study to the proposed North Carolina International Terminal at Southport. The Section 905(b) Analysis underpinning the feasibility study and cited as defining the scope of that study in the cost-sharing agreement between the Corps and the State is a modification of the analysis for the North Carolina International Terminal begun in 2009. The authorization was deemed adequate to change the scope of the analysis to the minor improvements in the Cape Fear River channel contemplated by the Secretary of NCDENR’s letter of intent, and funds originally authorized for the NCIT analysis were redirected. The analysis of the NCIT remains in the final Section 905(b) Analysis. Use of the feasibility study format instead of a general reevaluation report would facilitate use of that authorization to later redirect the study back to the NCIT project.

Conclusions

Shoaling at the river mouth and beach erosion. The only solution with any promise is reevaluation of the economics of maintaining the channel, and selecting an optimal shallower depth at which transportation benefits exceed maintenance costs. To the extent that the Military Ocean Terminal at Sunny Point requires a deeper channel than commerce, that cost should be shifted to the defense budget.

The channel turn at Battery Island. The Cape Fear River cannot accommodate larger vessels than now call at Wilmington, even with channel modifications. Continued passage by the largest of the vessels currently calling violates the recommended practice of the Corps of Engineers and international standards. This situation presents a risk that cannot be ignored–or inadequately addressed.

The turning basin at Wilmington. The turning basin at the Port of Wilmington is subject to shoaling, and the largest vessels calling at the Port can only be turned around under limited conditions of tide. The turning basin is already as wide as the river; enlarging the turning basin would involve excavation of rock, loss of 37 acres of habitat (including 28 acres of primary marine nursery area), and penetration of land now contaminated with PCP and other toxic materials.

A wider turning basin would have limited utility: larger vessels could not reach the Port of Wilmington because of the sharp turn at Battery Island.
**Benefit/cost analysis.** The “Section 905(b) Analysis” prepared by the Wilmington District to determine whether a feasibility study should be conducted contains many flaws, the most notable of which is the analysis of benefits and costs which has been rigged to show a surplus of benefits over costs. The report also includes as an alternative the dredging related to the planned North Carolina International Terminal, a project specifically excluded from the letter of intent delivered by the Secretary of the Department of Environment and Natural Resources. The analysis of benefits and costs for that alternative is also rigged to show a surplus of benefits over costs–by including “capture” of container traffic from other ports. That is not only unlikely, it is specifically prohibited by law.

**Restoration.** The alternative not considered in the Section 905(b) Analysis, which should be considered here, is restoration of the river channel to its former depth of 38 feet, which prevailed from 1973 to 2004. That would result in savings in the cost of maintenance dredging (compared to the cost of dredging that should be done for the 42-foot depth, but is not), and when considered on a National basis, would provide savings in transportation costs. That depth is sufficient for the Military Ocean Terminal at Sunny Point, and suggests that the Department of Defense should participate in the cost of maintenance of that depth. The problem of beach erosion at Bald Head should be attenuated, although the amount is unpredictable.

**Study format.** The Wilmington District recommended a feasibility study for this project, although in cases involving issues covered in a previous study (which these are) Corps regulations and practice require use of a different format, a general reevaluation report. Such a report, related to the Wilmington Harbor improvement project commenced in 1998 and still underway, was begun in 2005 but stopped in 2009. The share of the costs to be borne by the State of North Carolina as the “non-Federal sponsor” in a general reevaluation report would be substantially less than for the new feasibility study, 35% instead of 50%. Economic and environmental problems with the existing project would also be disclosed.

**Redirection.** The Section 905(b) Analysis underpinning the feasibility study, and cited as defining the scope of the feasibility study in the cost-sharing agreement between the Corps and State, is a modification of the analysis for the North Carolina International Terminal begun in 2009. The authorization was deemed adequate to change the scope of the analysis to the minor improvements in the Cape Fear River channel contemplated by the Secretary of NCDENR’s letter of intent, and funds originally authorized for the NCIT analysis were redirected. The analysis of the NCIT remains in the final Section 905(b) Analysis. Use of the feasibility study format instead of a general reevaluation report would facilitate later redirection back to the NCIT project.
Sources


