Final General Reevaluation Report
and
Final Environmental Impact Statement

on

Hurricane Protection and Beach Erosion Control

WEST ONSLOW BEACH AND NEW RIVER INLET (TOPSAIL BEACH), NORTH CAROLINA

Appendix P

Nonstructural Alternatives

APPENDIX P

NONSTRUCTURAL ALTERNATIVES

1. GENERAL. The nonstructural alternative that would avoid or delay damage due to erosion involves removal of structures from the hazard area. For this alternative, it is assumed that the first row of structures will be removed to avoid loss. As shown on Table P-2, the first cost of this alternative is around $96 million. It would require relocation of 71 structures and demolition of 312 structures.

2. EXISTING CONDITIONS.

2.1. ZONING RESTRICTIONS. Zoning presently requires new structures to be located 60 feet behind the existing vegetation line and 15 feet from the street right-of-way. These regulations preclude future development between the strand and the first roadway in some locations. Septic tanks with drain fields are used at Topsail Beach and zoning requires these to be within the setback as well.

2.2. AVAILABILITY OF REAL ESTATE. An estimate of vacant lots in each reach that may be available for relocation of structures was made based on review of existing aerial photography from May 2003. Due to the current rate of construction on Topsail Island and uncertainty of lot availability, this alternative was developed assuming only one third of these lots would be available as destinations at the estimated year of project construction.

2.3. DEVELOPMENT. The rate and intensity of new construction implies that any suitable ocean front lot will soon be developed before the shore projection project construction begins. The structure file for the without project condition includes structures assumed to be constructed in the near future on these suitable lots. The analysis of the nonstructural alternative includes both costs and benefits for removal of these potential structures.

3. MEASURES. This alternative involves use of one of three different measures on each structure selected.

3.1. RETREAT. Retreat is the relocation of a structure away from the hazard on the same lot. The ideal situation would be to have relatively deep beachfront lots that would allow the structures to be moved back over time as the coastline eroded. Work would include moving the structure to a newly constructed foundation and may also include replacement of the septic system etc. Costs for this measure are lower than for relocation due to the short distance of the move and the lack of associated real estate costs. Where space allows, retreat will be considered; however, very few existing lots are deep enough to allow retreat.

Approximately 22 structures – mostly in reaches 14 and 15 - could be moved back on their existing lot.

3.2. RELOCATION. Where retreat is not an option, this measure proposes relocating the structure to another lot. There are about 290 structures that could be relocated; however, it is estimated that only 49 lots would be available at Topsail Beach. It was assumed that there were four basic types of structures and that relocation of all of these structures would include new site preparation (utilities, new foundation, driveways etc.) and restoration of the existing site by demolition and removal of the foundation, driveways, septic system and utility connections. No attempt has been made to site each building. The selection of which structures would be relocated and which would be demolished was based on the value of the structures, estimated relocation cost and their proximity to suitable relocation sites. Due to vertical and horizontal restrictions on the NC 50 bridge crossing the AIWW at Surf City, any relocation off the island would require travel across the NC 210 bridge at North Topsail Beach, extending the haul distance considerably. For this reason, relocation off the island is not considered practical.

3.3. DEMOLITION. When the estimated cost of relocation was greater than the value of the structure or when real estate is not available for relocation, it was assumed that the structure would be demolished and payments equaling the market value of the structure and lot would be made to the owner. Demolition would include removal and disposal of structures, utility connections, septic system etc. and restoration of the site.

4 COST. Development of typical cost for the various measures is included in Table P-1. Cost includes construction, real estate, engineering, relocation assistance, construction management and a contingency.

4.1. STRUCTURE MOVE COST. The cost of moving a structure can vary greatly depending on site conditions, structure size, structure relocation type and haul distance. Costs used represent a move of a few blocks. Costs developed for each structure relocation type are as follows:

STRUCTURE RELOCATION TYPE I

These structures are on piles without a closed-in ground floor. They may be one or two story buildings and are typically in the 1500 to 2500 square foot range.

$92,000 / structure

STRUCTURE RELOCATION TYPE II .

These are similar to structure relocation type I; however, the ground floor has been improved. The ground floor may be either utility/ storage space, garage space or heated living space. For the purpose of this comparison, it is assumed that the ground floor at the new site will be developed as garage space with breakaway walls.

$107,000 / structure

STRUCTURE RELOCATION TYPE III

These slab on grade structures are typically the older structures. They may be one or two story, of wood or masonry construction and are typically 1000 to 2000 square feet. Moving cost for these structures is typically more than for structures on piles and in most cases relocation could not be justified.

$133,000 /structure

STRUCTURE RELOCATION TYPE IV .

This includes motels, condominiums and commercial structures. Cost of relocating these will be approximated for each structure using the cost per square foot for structure relocation type III..

4.2. RETREAT COST. For this analysis the cost of retreat was assumed to be the same as for relocation of a similar structure relocation type without the real estate cost.

4.3. DEMOLITION COST. Cost of structural demolition includes removal and disposal of the structure, foundations, paved areas, utilities, and septic systems and grading and planting as needed to restore the site. A cost of $17,000 / structure was used for a typical structure demolition in this analysis. In some cases this estimate was adjusted for buildings that were considered more or less difficult to demolish.

4.4. REAL ESTATE COST. Land Cost varies based on proximity to water. Although the lot that the structure is being relocated to may be several rows back, the cost of a typical first row lot is used. Beach frontage cost at Topsail Beach is in the range of $3000 / linear foot. A typical cost for a 65-foot wide beach front lot would be $198,000, including $3000 per lot for acquisition cost.

4.5. RELOCATION ASSISTANCE COST. Various relocation assistance payments would be required for the demolitions, retreats, and relocations. Research indicates that permanent residents occupy about 13% of the

structures. Based on this, the average cost per structure affected would be about $3000, which is included in the relocation cost above.

4.5 TOTAL COST. Total costs presented by reach and by type of structure is shown in Table P-2. The total first cost for this nonstructural plan is estimated to be $117,300,000. This is for practical purposes a present value cost.

5. BENEFITS. As with the beachfill alternatives, benefits were defined as the reduction in storm and erosion damages from the without project condition to the after removal condition. Damages with the nonstructural plan were computed by applying the without project GRANDUC storm and erosion analysis to a modified structure file. The structure file was modified to represent conditions with the nonstructural plan by setting the structure values of the affected structures to zero. The only residual damages come from the remaining second or third row structures and from land losses. Benefits estimated from the GRANDUC analysis are estimated to have an effective present value of $108,000,000.

6. TIMING. If this alternative were chosen, the question of whether the first row structures should be relocated or demolished in the base year or as they become threatened by the retreating shoreline would have to be addressed. It would be reasonable to relocate structures as they become threatened; however, by that time, vacant lots may no longer be available on the island. One possibility would be to purchase lots now for a relocation that may not occur for several years. Likewise, structures that would be demolished could be demolished as they become more threatened, allowing several years of use by the current owners. For this analysis, it was assumed that all costs are incurred at the beginning. The present worth of benefits is computed assuming that annual benefits all start in the first project year, not phased in beginning at some future date.

7. PROCUREMENT OPTIONS. The actions that would be taken to achieve this alternative could include purchase of available interior lots by the Government or sponsor and moving of the structures by a Government contract with the property owner retaining possession of the structure and the new lot but giving up ownership of the old lot. A more likely action would involve Government purchase of the beachfront structure and lot, with or without salvage rights, and payment of damages to the property owner in the form of a buy-out. This would be similar to the hazard mitigation buy-outs of homes in inland river floodplains. If the property owner retains salvage rights they would be responsible for locating suitable real estate and relocating the building. If the Government retained salvage rights the Government could surplus the structures as part of the demolition contract.

8. DISCUSSION

Except for reaches 14 and 15, implementation of the nonstructural alternative would result in an undeveloped strip between the beach and the first roadway.

This area could be used for parks, day-use parking, or other public uses until the erosion takes the existing land.

Assuming there is no beach or dune nourishment the dune will eventually fail leaving the roadway and the structures beyond the roadway with no protection against storm surge. Although not reflected in the cost of this alternative, there will likely be attempts to repair the dune as it fails and possibly use of sandbags etc. to protect the roadway. This alternative also would result in a reduction in the tax base and growth potential of the community.

This nonstructural alternative does not reduce damages to the second-row structures and does noting to prevent loss of the beach for recreation and habitat.

Overall the nonstructural plan has net present value benefits of -$9,300,000 with a benefit to cost ratio of 0.92 to 1.

9. OTHER NONSTRUCTURAL ALTERNATIVES. The concept of using nonstructural measures in combination with the dune/berm alternative to reduce the cost of dune and berm protection was also investigated.

9.1. HOT SPOTS. Localized groupings of structures closer to the surf than others could result in the dune construction line having to be shifted outward or could otherwise increase the size of the berm/dune template. If this was the case, moving a few structures could reduce the cost of the project. Review of aerial photographs and the cost/benefits by reach does not support existence of these hot spots or the potential project cost savings.

9.2. ENDPOINTS. Relocations could be used to reduce the length of the project by concentrating relocation efforts at the end of the project area. The South end of the project was considered for a nonstructural alternative since the number of structures on the beach in this area is fairly low. The concept was to begin the berm transition in reach 6, begin the full berm/dune section in reach 7 and relocate the 7 structures and one motel on reaches 6 and 7. This, however, would put Ocean Boulevard at risk of loss between reaches 4 and 6. This concept is not practical unless another means of access can be provided for the 150 residential structures on the south end of the beach. South of Trout Avenue, three navigation canals have been cut from the sound side of the island to the back of the lots along Ocean Boulevard making relocation of the roadway toward the center of the island impractical. This alternative is impractical and was not developed further as a nonstructural concept.

STRUCTURE RELOCATION TYPE	DESCRIPTION	CONSTRUCTION COST	E&D (15%)	S&I (15%)	SUBTOTAL	CONTENGENCY (20%)	TOTAL	HOUSING DIFFERENTIAL & MOVING	TOTAL (ROUNDED)
I	RELOCATE BLDG OPEN ON PILES	$ 56,929	$ 8,539	$ 8,539	$ 74,008	$ 14,802	$ 88,810	$ 3,000	$ 92,000
II	RELOCATE CLOSE IN FOR GARAGE	$ 66,757	$ 10,014	$ 10,014	$ 86,785	$ 17,357	$ 104,142	$ 3,000	$ 107,000
III	RELOCATE SLAB ON GRADE	$ 83,447	$ 12,517	$ 12,517	$ 108,481	$ 21,696	$ 130,177	$ 3,000	$ 133,000
I - III	DEMOLITION & DISPOSAL	$ 8,878	$ 1,332	$ 1,332	$ 11,541	$ 2,308	$ 13,849	$ 3,000	$ 17,000

Table P-1 Nonstructural costs

REACH	STRUCTURES				COST				
					CONSTRUCTION		ACQUISITION		TOTAL
	RELOCATIONS	RETREATS	DEMOLITIONS	TOTALS	REMOVAL - RELOCATION OR RETREAT	DEMOLITION	STRUCTURE	LANDS	
3	0	0	0	0	$ -	$ -	$ -	$ -	$ -
4	0	0	1	1	$ -	$ 17,000	$ 110,000	$ 198,000	$ 325,000
5	0	1	1	2	$ 400,000	$ 34,000	$ 110,000	$ 198,000	$ 742,000
6	3	0	11	14	$ 276,000	$ 187,000	$ 2,415,125	$ 2,772,000	$ 5,650,125
7	1	0	16	17	$ 317,000	$ 259,000	$ 2,818,625	$ 3,366,000	$ 6,760,625
8	3	0	12	15	$ 276,000	$ 204,000	$ 2,038,750	$ 2,970,000	$ 5,488,750
9	3	0	12	15	$ 306,000	$ 204,000	$ 1,881,875	$ 2,970,000	$ 5,361,875
10	1	0	19	20	$ 92,000	$ 323,000	$ 3,041,750	$ 3,960,000	$ 7,416,750
11	5	0	10	15	$ 505,000	$ 170,000	$ 1,740,875	$ 2,970,000	$ 5,385,875
12	2	0	11	13	$ 225,000	$ 187,000	$ 3,031,888	$ 2,574,000	$ 6,017,888
13	3	4	8	15	$ 749,000	$ 136,000	$ 1,224,763	$ 2,178,000	$ 4,287,763
14	4	6	4	14	$ 1,211,000	$ 68,000	$ 682,875	$ 1,584,000	$ 3,545,875
15	0	11	2	13	$ 1,162,000	$ 34,000	$ 190,000	$ 396,000	$ 1,782,000
16	5	0	8	13	$ 535,000	$ 155,000	$ 1,873,651	$ 2,574,000	$ 5,137,651
17	3	0	16	19	$ 291,000	$ 272,000	$ 2,495,875	$ 3,762,000	$ 6,820,875
18	0	0	19	19	$ -	$ 323,000	$ 3,376,625	$ 3,762,000	$ 7,461,625
19	1	0	13	14	$ 107,000	$ 255,000	$ 4,260,763	$ 2,772,000	$ 7,394,763
20	1	0	9	10	$ 963,000	$ 221,000	$ 4,389,875	$ 1,980,000	$ 7,553,875
21	1	0	18	19	$ 107,000	$ 306,000	$ 3,244,638	$ 3,762,000	$ 7,419,638
22	7	0	8	15	$ 734,000	$ 136,000	$ 1,308,875	$ 2,970,000	$ 5,148,875
23	5	0	12	17	$ 505,000	$ 204,000	$ 2,162,651	$ 3,366,000	$ 6,237,651
24	0	0	15	15	$ -	$ 255,000	$ 2,245,763	$ 2,970,000	$ 5,470,763
25	1	0	10	11	$ 107,000	$ 170,000	$ 1,526,776	$ 2,178,000	$ 3,981,776
26	0	0	6	6	$ -	$ 87,000	$ 650,664	$ 1,188,000	$ 1,925,664
TOTALS	49	**22**	**241**	**312**	**$ 8,868,000**	**$ 4,207,000**	**$ 46,822,682**	**$ 57,420,000**	**$ 117,317,682**

Table P-2, Nonstructural Summary