

9.3. The projected 10-year shoreline position for the 60-foot/year erosion rate is shown on Figure 9.3. The base shoreline used for this projection is shown in red and generally follows the July 2002 vegetation line.

9.4. The evaluation of the economic impact of Alternative A – No Action included damage to real property including cleanup cost once a structure is lost, damage to infrastructure (roads and utilities), construction of temporary access roads to isolated structures, loss of tax revenues for both the Town of Emerald Isle and Carteret County, and the reduction in household spending associated with the lost of homes. Alternative B – Relocate Homes, in addition to the damage to infrastructure, included the cost to the property owner to purchase a new lot and move the affected structure to the new lot. Alternative C – Sandbag Revetments, considered the total cost of providing temporary sandbag structures (construction, maintenance and removal, costs). Since the Town of

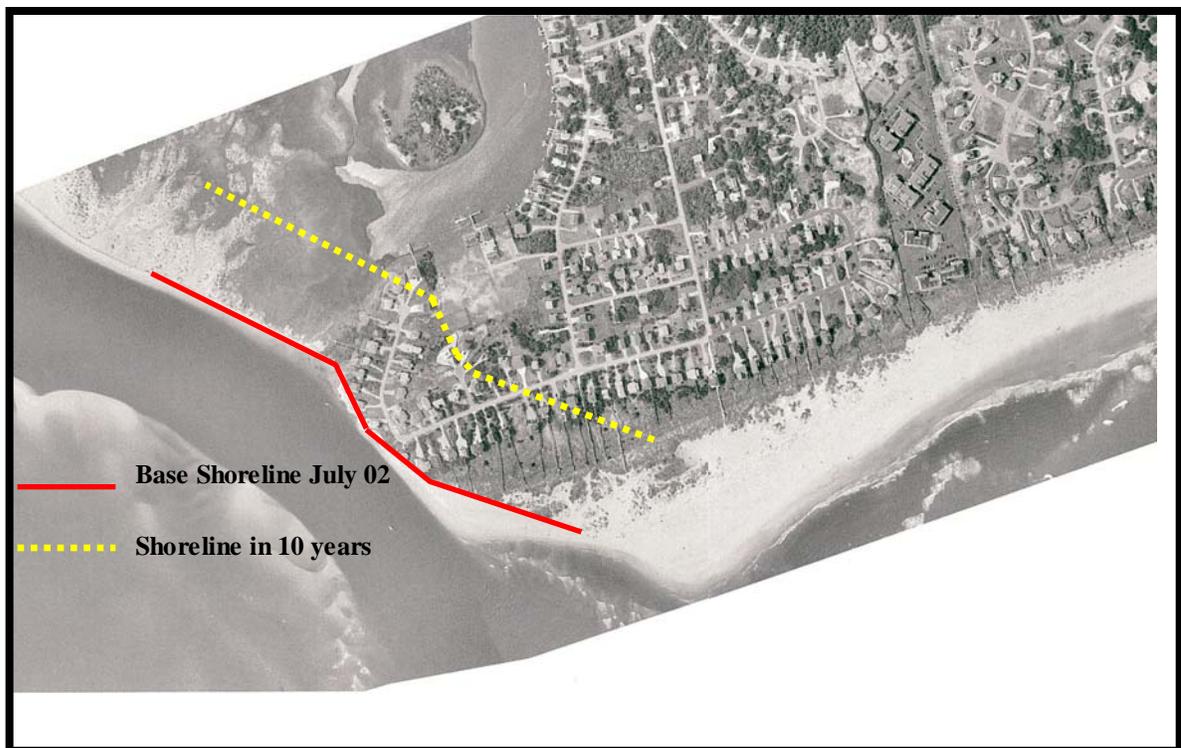


Figure 9.3 Without Project Shoreline Projection Based on Erosion Rate of 60 ft/yr

Emerald Isle still plans to provide beach nourishment along the west end of its shoreline, the cost of nourishing the 20,000 feet of beach using an offshore sand source was added to the economic losses associated with the erosion of the inlet shoreline in order to obtain a full measure of the total economic impact of the without project condition. Details of the without project analysis are provided in Appendix E.

9.5. **Alternative A.** Table 9.1 provides a summary of the damages and economic impact to Emerald Isle and Carteret County for Alternative A in 2-year increments. The

economic impact would include the loss of 36 structures and 1,640 feet of roads (Bogue Court, Inlet Drive, and Inlet Drive) and associated utilities. Table 9.2 includes the estimated \$5.8 million for nourishing the west end of Emerald Isle from an offshore sand source.

Table 9.1
Summary of Damages and Impact on Local Economy
(Alternative A – No Action)
Continued Inlet Shoreline Erosion Over the Next 10 Years

year	Cumulative Present Worth Damages ⁽¹⁾	Cumulative Present Worth Lost Taxes Town & County	Cumulative Present Worth Reduction in Household Spending	Total Present Worth Economic Impact
2	\$1,600,400	\$20,500	\$249,400	\$1,870,300
4	\$4,617,700	\$61,600	\$604,100	\$5,283,400
6	\$6,670,400	\$128,100	\$1,164,900	\$7,963,400
8	\$8,804,500	\$218,400	\$1,884,200	\$10,907,100
10	\$11,492,800	\$337,600	\$2,763,100	\$14,593,500

⁽¹⁾Includes lost structures, damage to infrastructure, and temporary access roads.

Table 9.2
Total Costs for Without Project – Alternative A – No Action
Including Offshore Nourishment Cost for the West End of Emerald Isle

Year	Total PW Damages & Economic Impact Plus Offshore Dredging Costs
2	\$ 7,670,300
4	\$ 11,083,400
6	\$ 13,763,400
8	\$ 16,707,100
10	\$ 20,393,500

9.6. **Alternative B.** Rather than allow the structures to fall victim to the continued eastward migration of the inlet shoreline, the Home Relocation Alternative assumes that each home owner would elect to move the structure to another lot located somewhere within the town limits of Emerald Isle once they become threatened. In this regard, the time line in and the number of structures that would become threatened are the same as the Alternative A. The relocation alternative involves the following:

- a. Purchase of a new lot
- b. Site work at the new lot that would include the installation of new utilities and the driving of new pile foundations.
- c. Clean-up of the abandoned lot. This would include the removal of any concrete slabs and the removal of the old septic system and other utilities.
- d. Prepare and move the structure to the new lot.
- e. Connecting the structure to the utilities installed on the new lot.

9.7. Based on the price of lots listed by several real estate companies in Emerald Isle, available lots in range in price from \$50,000 to \$150,000 for typical interior, i.e., non-waterfront lots. For this analysis, the cost of the new lot was assumed to be \$80,000 in 2002 with the cost of the lot purchase inflated by 4.8 % per year over the 10-year analysis period. The value of the structure situated on its new lot was assumed to hold its original value; therefore there would be no net loss in tax base for the structure. Since the existing lot is already included in the existing tax base, placing the structure on the lot was assumed not to affect its current tax value.

9.8. The costs of the Home Relocation Alternative were grouped into three categories: (a) cost to the property owner for purchase of a new lot and moving the structure to the new lot; (b) damage and cost to infrastructure at the Pointe; and (c) reduction in the Emerald Isle and Carteret County tax bases due to the loss of the abandoned lots. Damage and costs associated with the Pointe infrastructure would be the same as Alternative A. As was the case for Alternative A, the future tax rates for both the town and county were assumed to remain constant at their current values however, the future value of the abandoned lots were inflated by 4.8 % per year from their 2002 values to the year the lots would be removed by erosion. The Relocation Alternative would not involve any reduction in household spending since the assumption was made that all affected property owners would elect to keep there structures within the town limits of Emerald Isle.

9.9. A summary of the cost and damages for the Alternative B for each 2-year increment of the analysis is provided in Table 9.3 As was the case with the Alternative A, the Home Relocation Alternative would not provide any material for Phase 3 of the Emerald Isle beach nourishment project. Therefore, the town would have to complete Phase 3 using the approved offshore borrow areas at a cost of \$5.8 million. The cost for constructing Phase 3 of the Emerald Isle beach nourishment project using an offshore borrow area is included in the total cost column in Table 9.3.

Table 9.3
 Summary of Cost and Damages
 Alternative B – Relocate Homes
 Including Offshore Nourishment for Phase 3 Emerald Isle

year	Cumulative Present Worth Cost to Property Owners	Cumulative Present Worth Damage to Infrastructure	Cumulative Present Worth Lost Tax Revenues Town & County	Present Worth Cost and Damages	Phase 3 Beach Nourishment Cost Using Offshore Borrow Area	Total Economic Cost for Relocation Alternative
2	\$1,482,000	\$267,300	\$6,900	\$1,756,200	\$5,800,000	\$7,556,200
4	\$3,087,900	\$358,700	\$31,800	\$3,478,400	\$5,800,000	\$9,278,400
6	\$4,361,600	\$475,500	\$71,500	\$4,908,600	\$5,800,000	\$10,708,600
8	\$5,060,700	\$575,300	\$124,400	\$ 5,760,400	\$5,800,000	\$11,560,400
10	\$7,127,500	\$667,200	\$191,000	\$ 7,985,700	\$5,800,000	\$13,785,700

9.10. **Alternative C.** Once the existing sandbags are removed from the Pointe shoreline, 5 structures would immediately fall victim to the inlet shoreline erosion. At the end of the first 2 years of the analysis, a total of 7 structures would be destroyed. Over the 10-year analysis period, 900 feet 23 structures would be lost along with 900 feet of roads and utilities.

9.11. Future damages and economic impacts to Emerald Isle and Carteret County for Alternative C are summarized in Table 9.4 with the total economic impact, including beach nourishment from an offshore sand source, provided in Table 9.5.

Table 9.4
 Summary of Damages and Impact on Local Economy
 (Alternative C – Sandbag Revetments)

year	Cumulative Present Worth Damages ⁽¹⁾	Cumulative Present Worth Lost Taxes Town & County	Cumulative Present Worth Reduction in Household Spending	Total Present Worth Economic Impact
2	\$1,099,900	\$16,800	\$208,000	\$1,324,700
4	\$2,101,500	\$34,300	\$426,000	\$2,561,800
6	\$3,992,600	\$66,300	\$726,000	\$4,784,900
8	\$6,218,500	\$113,100	\$1,178,100	\$7,509,700
10	\$8,134,900	\$183,500	\$1,859,400	\$10,177,800

⁽¹⁾ Includes lost structures, damage to infrastructure, temporary access roads and costs associated with sandbags.

Table 9.5
Total Costs for Alternative C – Sandbag Revetments
Including Offshore Nourishment Cost for the West End of Emerald Isle

Year	Total PW Damages & Economic Impact Plus Offshore Dredging Costs
2	\$7,124,700
4	\$8,361,800
6	\$10,584,900
8	\$13,309,700
10	\$15,977,800

10.0 PROJECT COST ESTIMATE

10.1. A preliminary cost estimate for the channel relocation project is provided in Table 10.1. Included in the project cost are certain fixed cost associated with project design, preparation of an EIS, preparation of plans and specifications for construction, administrative cost by the Town of Emerald Isle, and pre- and post-construction biological monitoring cost.

Table 10.1
Preliminary Cost Estimate
13.5-ft NGVD x 500-ft Channel with Closure Dike

Item	Unit	Quantity	Unit Cost	Cost
Fixed Costs				
1. Town Administrative Cost	L.S.	1	\$ 65,000	\$ 65,000
2. Engineering & Design	L.S.	1	\$385,700	\$385,700
3. P&S and E&D During Construction	L.S.	1	\$137,500	\$137,500
4. Bio Monitoring, Pre & Post Constr.	year	4	\$143,000	\$572,000
Total Fixed Costs				\$1,160,200
Construction Costs				
1. Mob & Demob Dredge & Pipe	L.S.	1	\$900,000	\$900,000
2. Dike Construction	c.y.	200,000	\$1.72	\$344,000
3. Beach Nourishment	c.y.	809,500	\$2.91	\$2,356,000
Subtotal Construction Costs				\$3,600,000
Contingency (15%)				\$540,000
Total Construction Cost				\$4,140,000
Total Project Costs				\$5,300,200

10.2. A negative impact associated with the relocation of the Bogue Inlet channel will be the erosion of the ocean shoreline along the western 7,500 feet of Emerald Isle. This area

is presently in an accreted state due to the influence of the present inlet configuration. Once the channel is relocated, the profiles along the west end of Emerald Isle are expected to erode between 10 feet at a point 7,500 feet from the inlet to around 400 feet immediately adjacent to the inlet. The loss of this shoreline width could increase the vulnerability of development in this area to damage during coastal storms. Accordingly, the Corps of Engineers' storm erosion model, SBEACH, was used to assess the change in potential impacts to structures on the west end of Emerald Isle associated with the predicted change in shoreline position. As discussed in Section 3, the adjustments to the shoreline will probably take up to 6 years to occur.

10.3. The shoreline on the west end of Emerald Isle was divided into 5 reaches with each reach measuring approximately 1,000 feet. The boundaries of the various reaches were the Corps of Engineers baseline stations shown on Figure 3.26. The distance from the Corps of Engineers' baseline to the front of each structure was measured within each reach. SBEACH was run with a suite of 37 storms being used by the Corps of Engineers to assess storm damage potential along all of Bogue Banks. The suite of storms consist of actual storms known to have impacted the area since 1893 and included Hurricane Donna (September 1960), Hurricane Hazel (October 1954), Hurricane Fran (September 1996), and Hurricane Floyd (September 1999). A plot of the frequency of the storm still water levels used in the analysis is provided on Figure 10.2. Note that the erosive potential of a storm is not only a function of its maximum still water level but is also strongly related to the duration of the storm. For example, Hurricane Donna produced the highest still water level on record along Bogue Banks (+16.6 feet NGVD), however, the peak of the storm passed rather quickly and did not produce as much recession of the shoreline as storms with lower still water levels but much longer durations.

10.4. The SBEACH results provide a measure of the landward extent of expected storm impacts relative to the Corps of Engineers' baseline. Structures that would be impacted in each reach by the various storms were determine for the existing shoreline condition and with the adjusted shoreline following relocation of the channel.

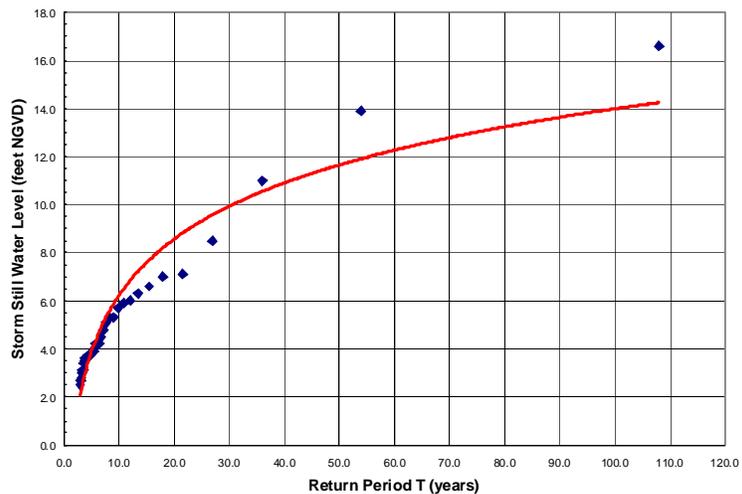


Figure 10.1 Frequency of Storm Still Water Levels

10.4. Under existing conditions, none of the structures in the 5 reaches would be impacted by any of the storms. For the adjusted shorelines, only storms with a return period of 10 years or more would impact any structures on the west end of Emerald Isle. For example, a storm comparable to the one

that occurred on September 5, 1935, which produced a storm still water level of 6.6 feet above NGVD (estimated return period of 11 years), would impact 2 structures between baseline stations 1252+76 and 1262+82 and 2 additional structures located between baseline stations 1272+70 and 1282+85. However, the impact on these structures would be minor for this particular storm. A much larger storm comparable to Hurricane Floyd (estimated return period of 41 years) could impact a total of 16 structures in the 4 reaches between 1252+76 and 1292+87. Some of these 16 structures would only experience minor damage while as many as 5 could have significant damage. This analysis did not assign damage amounts to the various structures, rather, the analysis was only done to demonstrate that there would be some minor increase in storm damage potential along the west end of Emerald Isle once the shoreline adjustments are fully completed. A summary of the number of structures that could be potentially impacted by various storms in each reach is provided in Table 10.2.

Table 10.2
Number of Structures that Could be Impacted by Coastal Storms
Following Relocation of the Bogue Inlet Channel

Storm	Swl Return Period (years)	Reach 1 1252+76- 1262+82	Reach 2 1262+82- 1272+70	Reach 3 1272+70- 1282+85	Reach 4 1282+85- 1292+87	Reach 5 1292+87- 1302+81
Sep 1935	11	2	0	2	0	0
Oct 1910	20	0	0	2	0	0
Floyd-1999	41	3	3	7	3	0
Hazel-1954	100	3	3	6	0	0
Donna-1960	220	0	0	2	0	0

10.5. Comparison of Project Costs and Project Benefits. The estimated cost of the channel relocation project are compared to the economic losses and other cost associated with the Alternative B – House Relocation. While the channel relocation project will cost the Town of Emerald Isle a little over \$5.3 million, providing a deeper and wider channel across the ebb tide delta of Bogue Inlet should eliminate the need for maintenance dredging in the inlet channel for at least 12 months. Based on past maintenance practices in Bogue Inlet, the elimination of 12 months of maintenance dredging will save the Corps of Engineers approximately \$534,000. Thus, the total net cost of the channel relocation project is equal to the total project costs minus the savings in maintenance dredging cost resulting in a net cost of the project of \$4,766,200. Dividing this net project cost into the total without project economic impact provided in Table 9.3 results in the following benefits to costs ratio (B/C) for each 2-year increment:

Table 10.2
Benefits to Cost Ratio for the Bogue Inlet Channel Relocation Project
(B/C given in 2-year increments)

Year	B/C Ratio
2	1.42
4	1.75
6	2.02
8	2.18
10	2.60

10.6. As noted above, storm damages could be slightly higher on the west end of Emerald Isle following the relocation of the channel. The increased damages would reduce the net benefits of the channel project but would not materially impact the economic viability of the channel project.

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