

Relocation Preferred Option to Save Hatteras Lighthouse

By Jim Wood

After a nine month study requested by the National Park Service, an expert committee of the National Research Council has determined that moving the Cape Hatteras Lighthouse about 500 feet southwest of its present location is the best way to save the historic structure.

Relocating the lighthouse away from the shoreline, where erosion threatens to topple the landmark, was deemed to be cheaper in the long run and less likely to damage the century-old beacon than other alternatives, such as building a seawall and revetment around its base or constructing offshore breakwaters and groins in an attempt to halt the erosion.

The 200-foot-tall lighthouse has been standing watch over North Carolina's Outer Banks since 1870, warning ships to steer clear of the treacherous Diamond Shoals – the so-called “Graveyard of the Atlantic,” where at least 600 ships have been lost.

Over the years, storms and powerful ocean currents have gradually eroded the eastern shoreline of Hatteras, transporting beach sand to its southern shores in a natural process that's causing the Atlantic barrier islands to migrate westward. At the time of its con-

struction, the lighthouse was approximately a quarter of a mile from the water's edge. Today this cushion has been reduced to a scant 50 yards, and experts say it's only a matter of time before waves undermine the structure and topple it into the sea. A hurricane could wipe it out at any time.

The NPS had asked the Research Council committee in July 1987 to evaluate alternative ways to save the structure. The committee was not asked whether the lighthouse should be saved, but was asked only to determine the best options for preserving it. The Council, an operating arm of the National Academies of Science and Engineering, estimated moving the lighthouse would cost about \$4.6 million and take nearly a year, including planning and site preparation. The actual move will take about three months.

The 2,800-ton tower could be moved safely with proper bracing and engineering techniques, according to the committee. First, the external structure would be strengthened and reinforced as an integral unit by vertical and circumferential prestressing, using concrete tie beams with prestressed rods and tendons. Next, the foundation of the lighthouse would be tun-

neled for insertion of a series of needle beams. The lighthouse (minus part of its below-surface foundation and the timber mat) would then be vertically raised by hydraulic jacks to clear the below-surface foundation that remained.

The lighthouse would be lowered onto rollers that rest on multiple horizontal steel-rail beams supported by precast concrete piles. The entire lighthouse structure would be moved on the tracks with hydraulic jacks and slowly pulled with winches to its new site, where it would be placed on a newly-constructed foundation, such as a pile-supported concrete mat. The Keeper's Quarters and other buildings in the complex would also be moved (using standard housemoving techniques) and placed in the same proximity to the lighthouse.

Because the lighthouse may have to be moved again in 25 to 100 years to escape additional beach-front erosion, the committee proposed that the lifting beams be left in place to facilitate future relocation. Such "multi-stage" relocation would be a "flexible response to a dynamic problem," the committee said. With this foundation in place, a second move would cost about \$1.6 million in 1988 dollars, the committee projected.

Building a seawall would cost at least \$5.6 million by Army Corps of Engineers estimates. During the year-long construction process, the lighthouse would be particularly vulnerable to risk from storms. The seawall option also conflicts with many national, state, and NPS policies. Moreover, the wall would obscure much of the lighthouse itself, while continued erosion would eventually separate the lighthouse from the mainland and effectively foreclose future preservation options, the report says.

Rebuilding the existing groinfields and providing a protective underground casing or revetment to prevent undermining of the lighthouse would take less than a year and cost from \$4.7 to \$6.7 million. While it would protect the lighthouse for 20-30 years (barring a disastrous storm), the committee said, it would be difficult, if not impossible, to maintain a protective beach in front of the lighthouse indefinitely. The revetment casing would make future relocation difficult and expensive and also conflicts with relevant public policies, it noted.

The committee considered other options, as well, but rejected them after preliminary study showed them to be even more unsuitable than the seawall or groin-field options.

Because of the intense public interest in preserving the lighthouse, a new Park Service document evaluating these options is scheduled to be released for public comment this fall. The alternatives will be (1) moving the lighthouse to one of several possible sites, (2) building the seawall and revetment, or (3) a combination of a smaller revetment and improvements to the existing groins.

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The Cape Hatteras Lighthouse is the tallest brick lighthouse in the United States. Weighing 2,800 tons, it is also one of the heaviest.