The
State of the Region's Beaches
(Hampton Roads, Virginia)

for
The Regional Studies Institute
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Summary

Over the past 50 years, the economic importance of the region's beaches for recreation, tourism, and storm damage mitigation has created the need for beach nourishment projects. This report focuses on three concerns with beach nourishment, namely:

- Will it work?
- Does hurt the environment?
- Who pays for it?

If success is measured in terms of tourist benefit for the region's economy (business, personal income, government income) then we conclude that beaches ***generate*** money for the region. Storm damage reduction benefits from Hurricane ISABEL (Sep. 18, 2003) alone almost add up to renourishment costs so that beaches ***save*** money in the region. We conclude that beach nourishment does work in the region.

Strict environmental controls are presently in place for beach nourishment. Turtle nesting space is increased and eggs are routinely relocated during beach construction. Research is needed to understand the recovery phase (diversity, numbers, time) of microorganisms immediately following construction.

All levels of government (federal, state, local) funding for beach nourishment projects, including the US Army, Corps of Engineers projects, are discussed. Because all three government levels benefit, all must share the expense. The distinction between "pork-barrel" and "piggy-bank" projects is made and it is clearly demonstrated that beach nourishment saves money for the "rainy" days when storms strike the coast. It is not a waste of taxpayer money. However, the State's Public Beach Board has been zero funded since 2000. Future financial constraints for the region's public beaches will remain a long-term problem until the Commonwealth develops a dedicated funding source. The overall grade for the region's beaches is B because of this lack of state funding.

Our legacy to our children must be well-maintained, clean, safe, and beautiful beaches for all to enjoy today, tomorrow, and in the future.

Preface

The seventh annual State of the Region Report (SOR) from Old Dominion University (September 2006) includes a chapter on the beaches of the region. A First Draft of the report herein was provided to Dr. James V. Koch, editor of the SOR series in April. Our views expressed in the Final Report may differ from those found in the SOR (2006) chapter on beaches. This Final Report includes a listing of over 80 references to support the findings reported herein.

Comments, criticisms, and suggestions for improvements should be directed to the first author at (dbasco@cee.odu.edu)

Acknowledgements

A large number of individuals responded to our letters and provided information for this report. We gratefully acknowledge the help of Congresswomen Thelma Drake and Sarah Hamlett of her staff; Dr. Jim Houston and Jerry Swean, Corps of Engineers; Lee Hill, Commonwealth of Virginia; Scott Hardaway and Donna Milligan, VIMS; Phill Roehrs and Mike Kay, City of Virginia Beach; Lee Rosenberg and Jim White, City of Norfolk; James Freas, Donn Leavenworth and Tom Daniel, City of Hampton; Howard Marlone, American Shore and Beach Protection Association; Tony Pratt, State of Delaware, Carrie Dean, Blue Flag Organization; Judy Boone Realty and Dr. Vinod Agarwal, Dr. Gilbert Yochum and Dr. Jim Koch, Old Dominion University.

Miriam Tejeda typed the manuscript and Don Emminger developed the graphics in the extremely professional manner shown. We thank them for these fine efforts. We apologize to anyone who helped and is not listed above.

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Figure 15 **Dam Neck beach, summer, 2002. Our region's beaches are a treasure and must be maintained for all to enjoy today and as a legacy for our children in the future. (Author's photo)**

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Section 1
Introduction

Next year (2007) will mark the 400-year anniversary of the first, permanent European settlement in "the new world" at Jamestown. The beach location that commemorates this historic event is called Cape Henry Memorial Cross and nearby is First Landing State Park in Virginia Beach (Figure 1). For thousands of years, beaches have been important in Western Culture (art, literature, medicine, music, recreation, sports, etc.). For example, recall "*The edge of the sea is a strange and beautiful place"(Rachel Carson, 1955)*[1]. Since the late 19th century, trains brought rich families from the East Coast States for ocean front vacations to what is now the City of Virginia Beach. Today, airplanes routinely fly tourists for beach vacations all over the world and automobiles have made beach access affordable for low-income families.

But beaches are also nature's way of protecting the coast and what's behind it. Wide, sandy beaches and the dunes behind them reduce the power of the waves in hurricanes and "northeastern" storms so that less damage occurs to upland homes, roads, utilities, etc. Coastal ecosystems (micro-organisms, worms, crabs, birds, turtles, etc.) may also benefit from wide, clean beaches and non-polluted, adjacent waters. The three often cited benefits of wide, healthy, sandy beaches are namely: (1) recreation and tourism; (2) storm protection; and (3) the environment. So what is the "state" of our region's beaches to provide these three benefits? How have they faired after 400 years, especially the last 100 years when the population has grown to over 1.6 million people in the region. This chapter provides some answers to these questions and to many others regarding the economics of the region's beaches (Figure 2). Virginia has over 5000 miles of shoreline including the Chesapeake Bay, but only 29.14 miles of public beaches with 26 miles in the region. We include the dunes in this discussion, if present, whenever the term "beach" is mentioned.

We are especially interested in the last 50 years when the economic importance of beaches for recreation, tourism, and storm damage mitigation have created the need for beach nourishment projects. Driving the need is the almost 5.8 feet increase in local sea level over the past 400 years in the region (Figure 3).[2] We focus on three commonly expressed concerns with beach nourishment; namely:

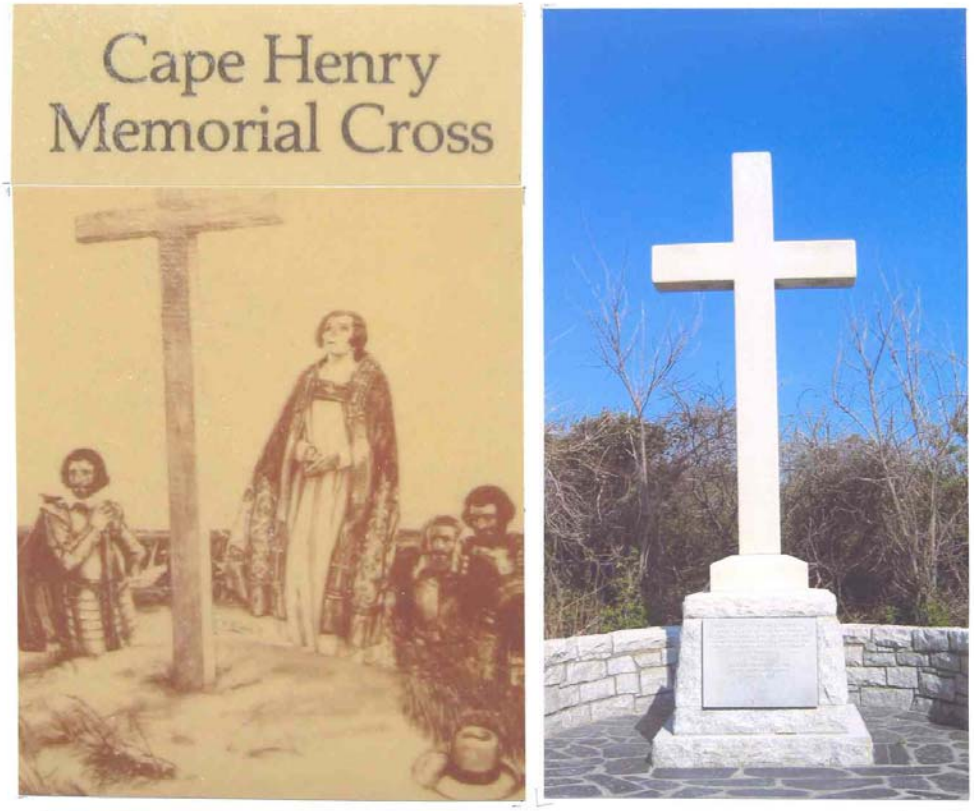

Figure 1 **Beach location that commemorates the first landing on April 26, 1607 of three small ships from Europe is called Cape Henry Memorial Cross and nearby is First Landing State Park in Virginia Beach. A concrete cross was erected in 1937. A view looking south from the wide sandy beach now includes high-rise hotels in the distance.**

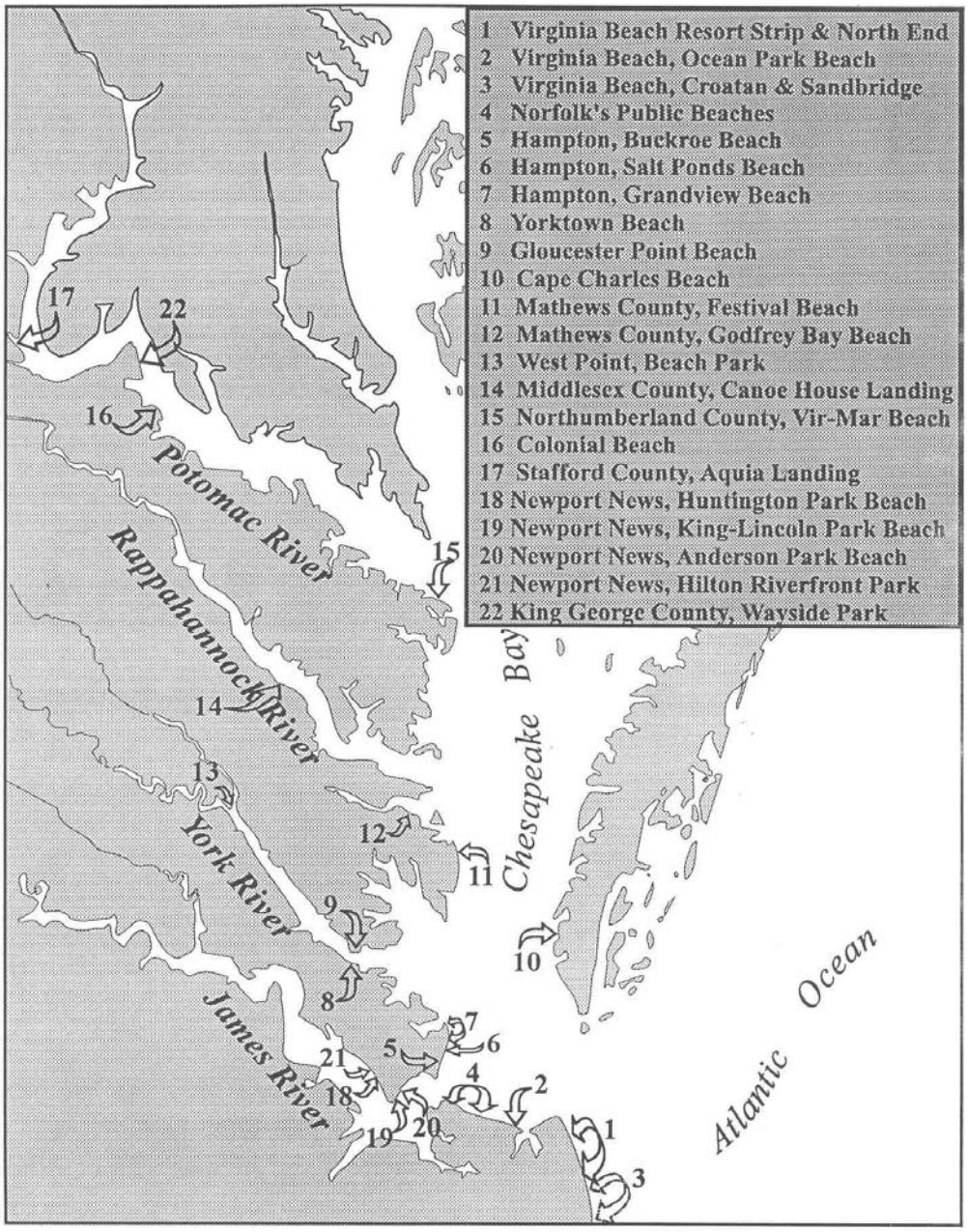

Figure 2 Locations of Virginia's public beaches, (We focus on those beaches in Virginia Beach (1, 2, 3) Norfolk (4) and Hampton (6, 7, 8). (From Senate Document N. 32, Board on Conservation and Development of Public Beaches, Commonwealth of Virginia, 1998)

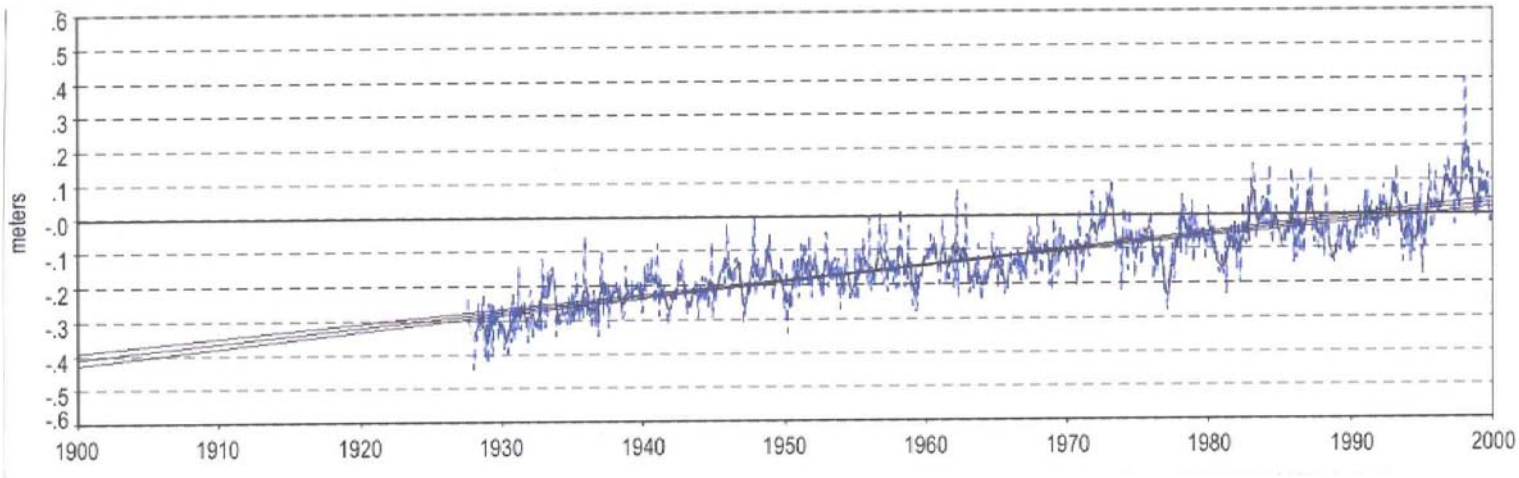

Figure 3 **Sea level rise from tide gage readings (Sewells Point, Norfolk) from 1927-1999 (73 years, inclusive). The mean sea level trend is 4.42 millimeters (mm) per year (1.45 feet per century). If this rate is assumed constant for 400 years, then the local sea level has risen 5.8 feet in that time period. The local rate is 3-4 times the global, average rate of 1 - 1.5 mm per year. (From CO-OPS, NOS, NOAA, online) On a shoreline with slope 1:50, the distance inland that the ocean has advanced over 400 years is almost 300 feet. But for a beach nourishment project lasting 50 years, the elevation change of 0.0145 ft/year (3/16 inch per year) is not noticeable and the horizontal change is about 36 ft in 50 years. Thus the sea level rise is included in the multiple nourishments required for beach nourishment projects.**

1. Will it work?
2. Does it hurt the environment?
3. Who is going to pay for it?

In Section 2, we address the first concern, will it work, and how to define “success” (or failure) for the three economic benefits listed above. Then in Section 3, we consider the general ecosystem surrounding beaches and discuss a “Blue Flag” system for rating the environment. Finally in Section 4, the costs and concerns for who pays will be addressed. A summary of beach management is found in Section 5.

It all began here 400 years ago. A look into the distant and recent past is helpful to understand where we are today, and where we are headed in the future.

Section 2
Does Beach Nourishment Work?

2.1 What is Beach Nourishment?

Simply, beach nourishment is the placement of new sand on the beach that was "borrowed" from offshore (or upland) sites to restore the beach to some previous condition or "design" state. This new sand must be compatible with the natural sandy material (range of sizes, color, density). It is not a one-time effort, but maintenance is required. The beach is considered as infrastructure (roads, utilities, water and sewer, etc.) that continually must be maintained and upgraded. To answer the question, does it work; we must first determine how to define success (or failure)? Generally, success (or failure) is judged in economic terms for *benefits* for the region's (1) the tourism industry, (2) property values, and (3) reduction in storm damage. Success (or failure) in economic terms for *costs* is discussed in Section 4, below.

2.2 Regional Tourism

Travel and tourism is now the world's largest industry[3, 4]. Beaches are the number one vacation destination in the US[3, 4].

Beginning in 1951, the City of Virginia Beach and its' "Resort Beach" (43rd street South to Rudee Inlet, See Fig. 2, No. 1) has been replenished every year with about 400,000 cubic yards, now totaling 20 million cubic yards of sand to counteract the long term, natural erosional trends at this location. This effort was mainly to benefit the tourism industry[5].

It is well recognized that the economic impact of tourism is very significant to the economy of Hampton Roads. Researchers in the Economics Department of Old Dominion University in cooperation with the City of Virginia Beach have for many years estimated the economic impact of tourism for the city. For 10 years of data collected (1995-2004) Table I summarizes revenues and expenditures associated with tourism and adjusted for inflation[6]. All numbers are in 2004 prices. The data indicates a steady increase in both revenues and expenditures. Tax revenue to the City of Virginia Beach was primarily from sales taxes (68.1%) and secondly from property taxes (19%). In 2004, $14.4 million was spent for capital

improvements with $3.2 million (22.2%) for the local share of the Corp's beach erosion control and hurricane protection project.

Table I - Trends in Revenues and Expenditures Associated with Tourism for the City of Virginia Beach

Year	Real Direct Revenues	Real Direct Expenditures
1995	44.3	27.0
1996	46.6	27.6
1997	48.7	31.8
1998	50.6	32.3
1999	52.3	38.9
2000	55.4	35.4
2001	56.9	35.0
2002	64.8	41.8
2003	65.4	33.7
2004	67.2	47.4

Data in Millions of Dollars

Source: **Virginia Beach Tourism Economic Impact Study**, Gilbert Yochum and Vinod Agarwal, Bureau of Research, College of Business and Public Administration, Old Dominion University, various years

Figure 4 displays the local trend at Virginia Beach in tourism relative to the rest of the nation. The increase in local tourism in the aftermath of the September 11, 2001 terrorist attacks is clearly seen and statistically relevant. The increased beach width following completion of the Hurricane Protection Project in 2002 (see below) also increased the beach visitor numbers in the city.

The ODU data set[6] also asked if visitors were planning to return or were repeat visitors. Repeat visitors are important because they provide a dependable stream of spending to the local economy. Table II indicates a positive relationship with the share of visitors indicating that they are repeat visitors and the one-year lag of beach nourishment. This is significant because it indicates the benefits from a type of brand loyalty to Virginia Beach by visitors and investments in sand replenishment.

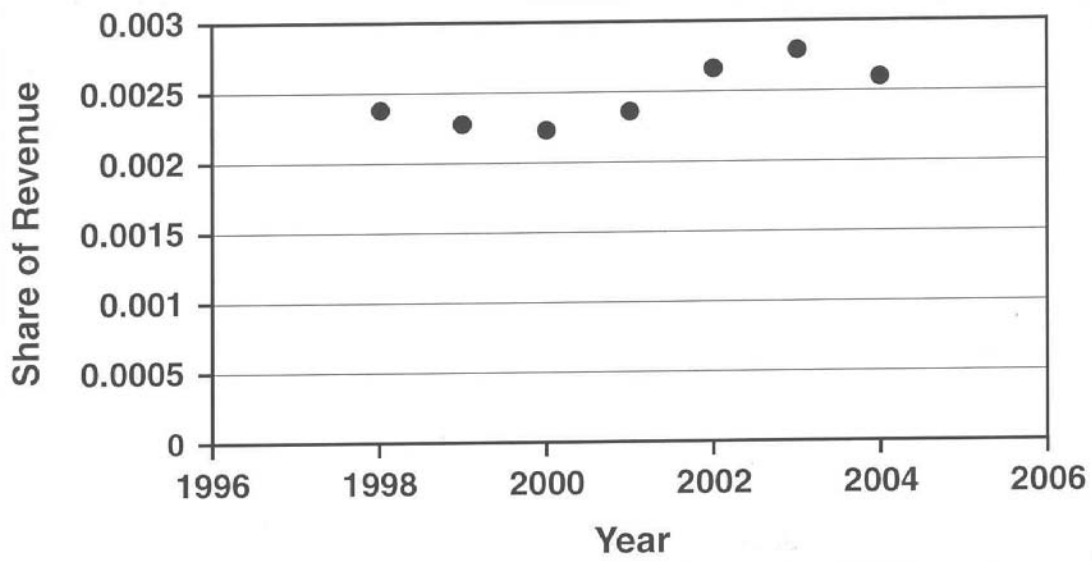

Figure 4

The ratio of hotel revenue in Virginia Beach to the entire United States for 1998-2004. For the 3 years (1998-2000) the relative share was falling. The September 11, 2001 terrorist attacks may have contributed to the positive increase for the next 3 years (2001-2003) because East Coast tourists preferred driving shorter distances than flying to Florida for beach vacations. The positive increase could also be attributed to the beach nourishment project that began in 2000 and was finished in 2002 to significantly widen Virginia Beach.

Table II – Number of Visitors to Virginia Beach from 1994-2004 and Dates for Beach Nourishment Projects

Year	Repeat Visitor Percentage	New Sand Cubic Yards
1994	71.8	311790
1995	68.6	303318
1996	69.4	289450
1997	75.0	300000
1998	72.7	3200000
1999	75.8	4000000
2000	73.6	0
2001	73.0	0
2002	78.0	3200000
2003	78.2	4000000
2004	77.6	0

Source: **Virginia Beach Tourism Economic Impact Study**, Gilbert Yochum and Vinod Agarwal, Bureau of Research, College of Business and Public Administration, Old Dominion University, various years and United States Army Corp of Engineers.

2.3 Property Taxes

Waterfront property is always valued above that nearby without this amenity. Determination of what someone is willing to pay for the amenity may be estimated by Hedonic Pricing. Property tax assessments are made by each city in the region and each city applies it's own property tax rates.

The City of Virginia Beach property tax rate has always been below those for the other cities in the region. In 2006, the City of Virginia Beach rate was $1.0239 per $100 assessed value, whereas Norfolk was $1.350 per $ 100 and Hampton was $1.250 per $100 assessed valuation and the other cities in the Region were also all higher. The beach driven tourist income earned by the City of Virginia Beach is often cited as one reason for the lower property taxes.

Waterfront property with a beach is even a greater amenity. A recent, study in Carteret County, NC estimated that a house on the beach was $60,000 higher in value than an identical house nearby but not on the beach[7]. This

extra amount ($60,000) was also cited by a local relater[8] for the Ocean View area of Norfolk's beaches. In another study[9], it was learned that a typical renter in a city with a beach would be willing to pay almost $1000 more per year to live there.

2.4 Storm Damage Reduction

The region's proximity to the Atlantic Ocean makes it vulnerable to coastal storms (hurricanes and northeasters') that cause damage by flooding, waves and erosion. Sandy beaches respond to storm conditions by changing their profile to sand bars under water that break the waves further offshore. In general, the wider the beach, the less damage to upland structures, roads, utilities, etc. Or, in other words, the further the distance from the ocean, the less damage occurs to structures in a storm event. (Note, that wind damage is not included, herein).

The textbook example for this fact is taken from field data of distance and structural damage collected following Hurricane Eloise (1975) in Florida as shown in Figure 5.[10] The red curve is actual damages (thousands of dollars) to 540 structures relative to their distance in feet from the ocean. The green curve is the reduction in damages that a 50 ft wide beach nourishment project would produce. The greatest reduction in damages is for the structures close to the ocean. The State of Florida enforces a construction control line (CCL) to restrict construction too close to the sea.

The world's first beach nourishment project took place in 1923 at Coney Island, New York.[11] Since the early 1970's beach nourishment has been the preferred shore protection alternative of the US Army, Corps of Engineers.

In 2002, "Operation Big Beach" was completed to widen the Virginia Beach Oceanfront 300 ft as part of the Beach Erosion Control and Hurricane Protection Project, a joint effort between the US Army, Corps of Engineers and the City of Virginia Beach. Figure 6 (summer 2002)

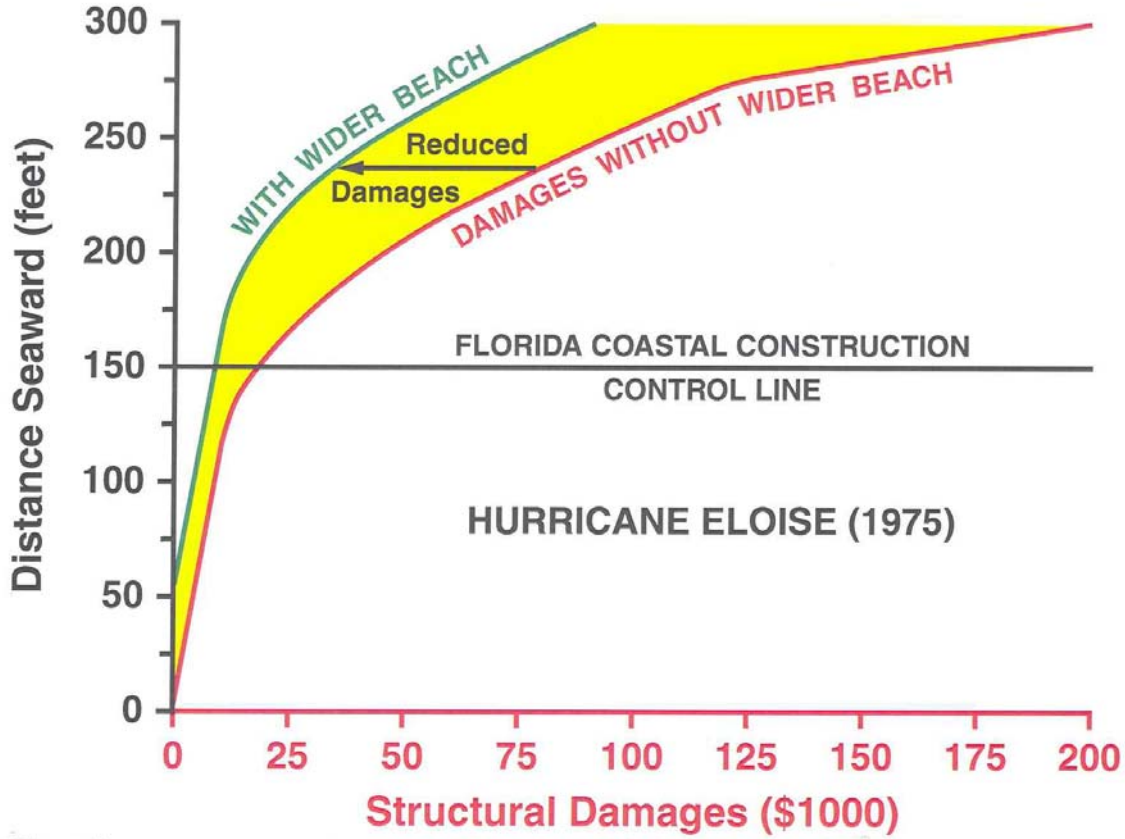

Figure 5

Damage to structures (in thousands of dollars) in relation to their distance from the ocean resulting from a study of 540 structures on Bay Country, Florida after Hurricane Eloise in 1975. (The graphics shown is adapted from Dean, 1988, reference 10)

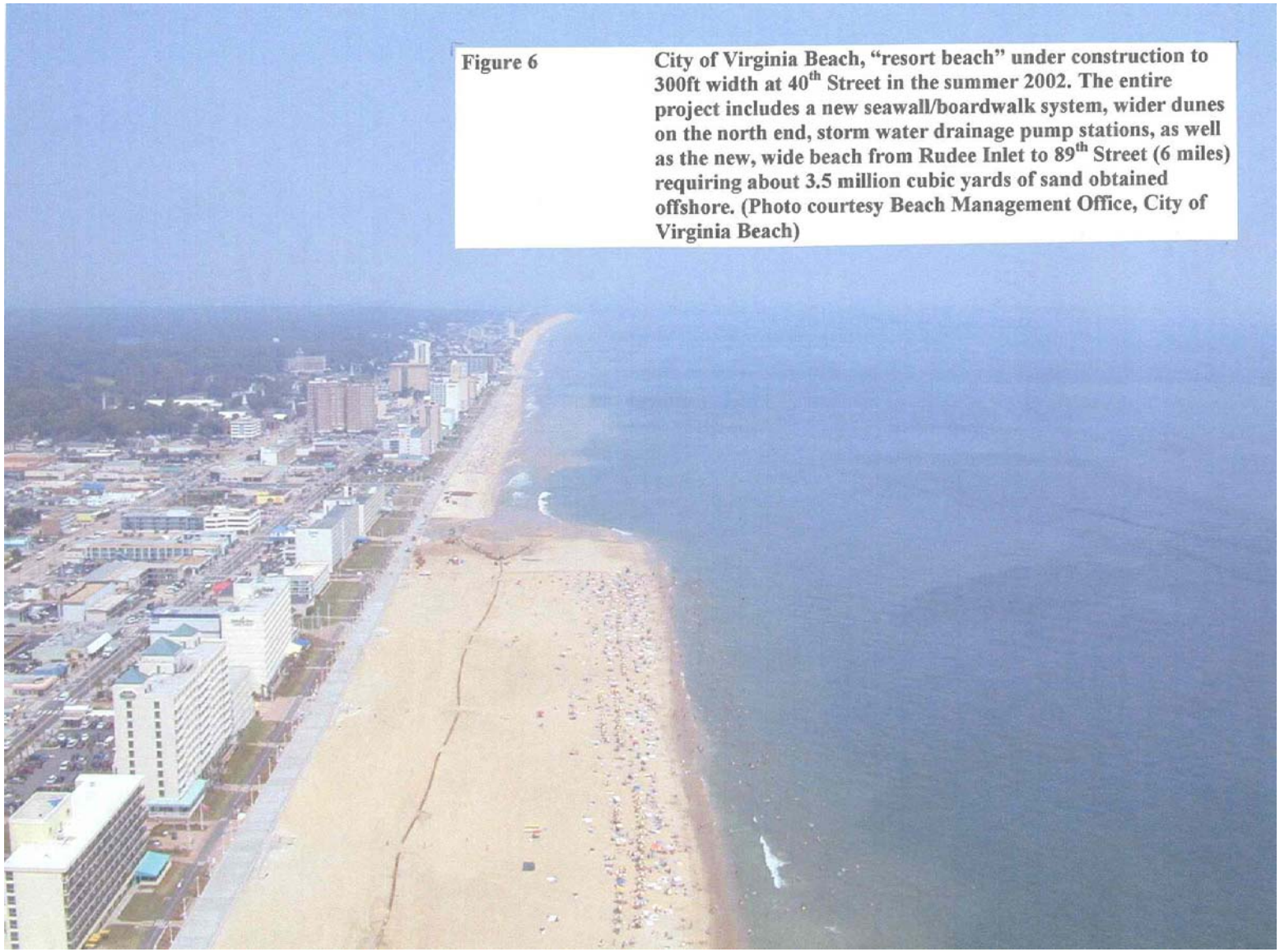

Figure 6 City of Virginia Beach, "resort beach" under construction to 300ft width at 40th Street in the summer 2002. The entire project includes a new seawall/boardwalk system, wider dunes on the north end, storm water drainage pump stations, as well as the new, wide beach from Rudee Inlet to 89th Street (6 miles) requiring about 3.5 million cubic yards of sand obtained offshore. (Photo courtesy Beach Management Office, City of Virginia Beach)

shows the beach width being increased by pumping sand mined offshore and placing it from Rudee Inlet to 89th Street (6 miles, 3.5 million cubic yards).

Sandbridge Beach (See Fig. 2, No.3) is also now a joint project between the City of Virginia Beach and the Corps of Engineers. Sand nourishment has taken place in 1998 and again in 2003 (May) when two million cubic yards of sand widened the beach 100-150 ft over the almost 5 miles of oceanfront. Figure 7 displays the estimated annual damages ($1000) due to flooding (higher water elevations) at Sandbridge (without a wider beach, red) and with the 2003 renourishment project (green).[12] The largest benefits (damage reduction) are for the smaller coastal storms (lower water levels) with a high probability of occurrence each year (black curve). The wider beach also reduces the wave energy at Sandbridge to lower the damaged expected to existing bulkheads and sand loses from erosion (damage reduction curves for wave energy reduction by beaches not included herein).

Hurricane ISABEL (Sep. 18, 2003) provided a severe test for the beaches of the region to reduce the damages to upland property. Flood levels were the second highest ever recorded and only 0.13 feet (1.6 inches) below the record August 1933 Hurricane event.[13] If ISABEL had occurred one week later during spring tides, it would have established the all time record for the region. It was labeled "A Storm of Historic Proportions" at the 26th Annual National Hurricane Conference[14] and the American Shore and Beach Preservation Assoc. (ASBPA) published a special issue of Shore and Beach magazine to document its impacts, primarily in North Carolina (NC).[15] It made landfall west of Ocracoke Inlet, NC as a category 2 hurricane with maximum winds near 100 mph. Hurricane wind speed is only weakly linked to storm surge elevations as demonstrated for ISABEL where the category 2 winds produced record water levels, in the region.

The Norfolk District, Corps of Engineers, conducted post-Storm damage surveys to upland property along with water level-versus- damage curves, such as Figure 7. It was learned that the "Resort Beach" nourishment project *prevented* $82 million in damages [$52 residential property, $15 million commercial interest and, $15 million infrastructure (roads, sewer, power, water lines and the new oceanfront Boardwalk)].[16] Similar studies for Sandbridge found $23 million in *damage prevention* by the beach nourishment in 1998 and the second completed in May 2003, four months before ISABEL struck the coast. Stories about these storm damage reduction

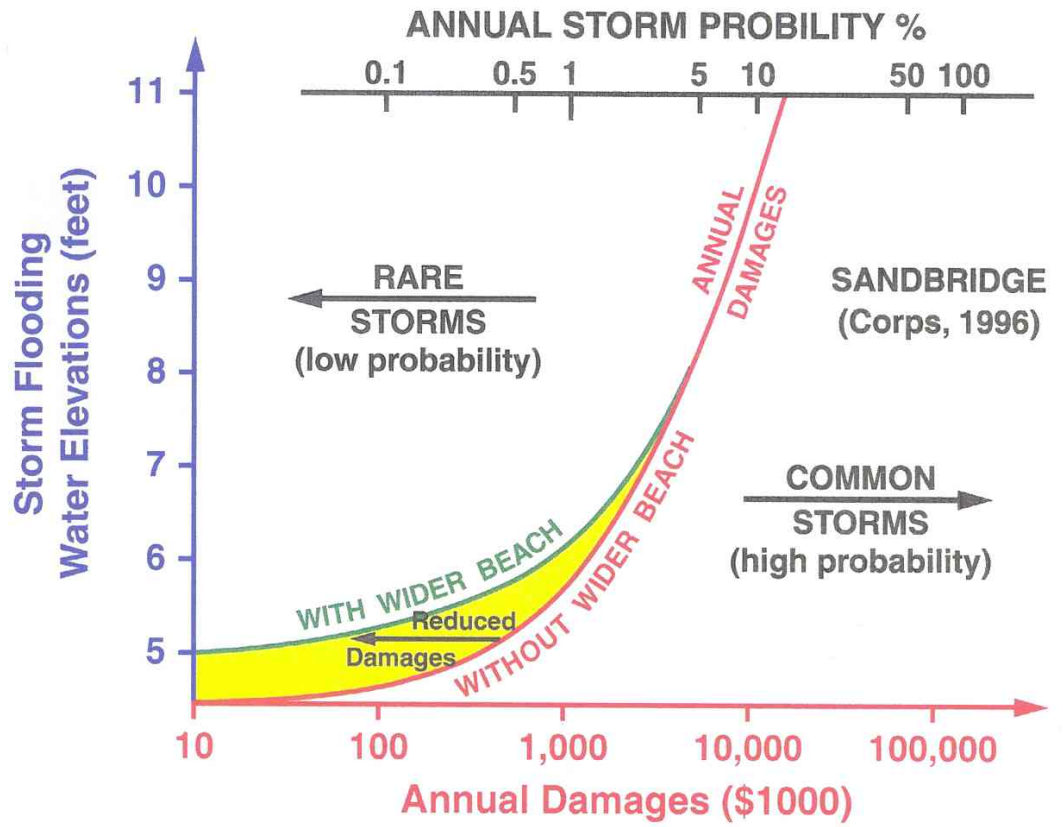

Figure 7

Estimated, annual structural damages ($1,000) at Sandbridge, VA from elevated, water levels (storm surge, flooding, elevations, feet). The red curve is estimated from actual surveys of residential structures, contents and indirect damages after storms conducted by the Norfolk District, Corps of Engineers (Reevaluation Report April 1996). The green curve is with a wider beach in place and shows the reduced damages that result. The annual storm probability of exceedance curve (black line) for these water elevations is from tide data at the Sewells Point tide gage (Norfolk, since 1927 and includes the benchmark August 1933 hurricane and 1962 Ash Wednesday northeastern storm data.

benefits of beaches were published in the Virginia-Pilot newspaper and received national publicity in USA Today.[16-19]

A 1996 study[20] by the Water Resources Institute in Wash DC determined that over the 30-year period that a Federal government project was in place for Virginia Beach, the actual, average, annual Storm Damage Reduction (SDR) benefits were $ 6.9 million. The SDR benefits predicted in the original studies used to justify the Benefit/Cost (B/C) ratio were $6.6 million (5 % lower). Benefits included structural damage, road protection (public safety) and land loss prevention (erosion). The numbers cited above for the SDR benefits for the Resort Beach and Sandbridge Beach for Hurricane ISABEL are real.

The cities of Norfolk (Ocean View Beach, Figure 2, No. 4) and Hampton (Buckroe Beach, Figure 2, No. 5) do not have Federal Government sponsored projects. But they both have sporadically funded beach nourishment projects over the past 25 years. In Norfolk, these efforts were responsible for an estimate savings of $5 million in damages from ISABEL.[21] And, for Buckroe Beach in Hampton, $3 million in damages were prevented for ISABEL.[22] Without these previous beach nourishment efforts over the years, the damages from ISABEL would have been much greater.

The US Government, Navy facility in Dam Neck also greatly benefited from the 1996 project to strength the dunes and to rebuild the beach. It was estimated that $18 million in *damage prevention* resulted for the multi-story housing facilities and 16-inch gunnary range at the oceanfront.[23]

These damage prevention benefits from Hurricane ISABEL are summarized in Table III. They totaled over $130 million for this one major storm event. Each year, many other hurricanes and northeastern storms cause coastal damage that have been and will continue to be reduced because of beach maintenance efforts in the future.

2.5 Other Benefits

The region's beaches can be considered as urban parks for local recreation benefits (Figure 8). And, they provide a regional identity for the many festival (art, music, etc.), sporting events (surfing, volleyball, etc.), or just

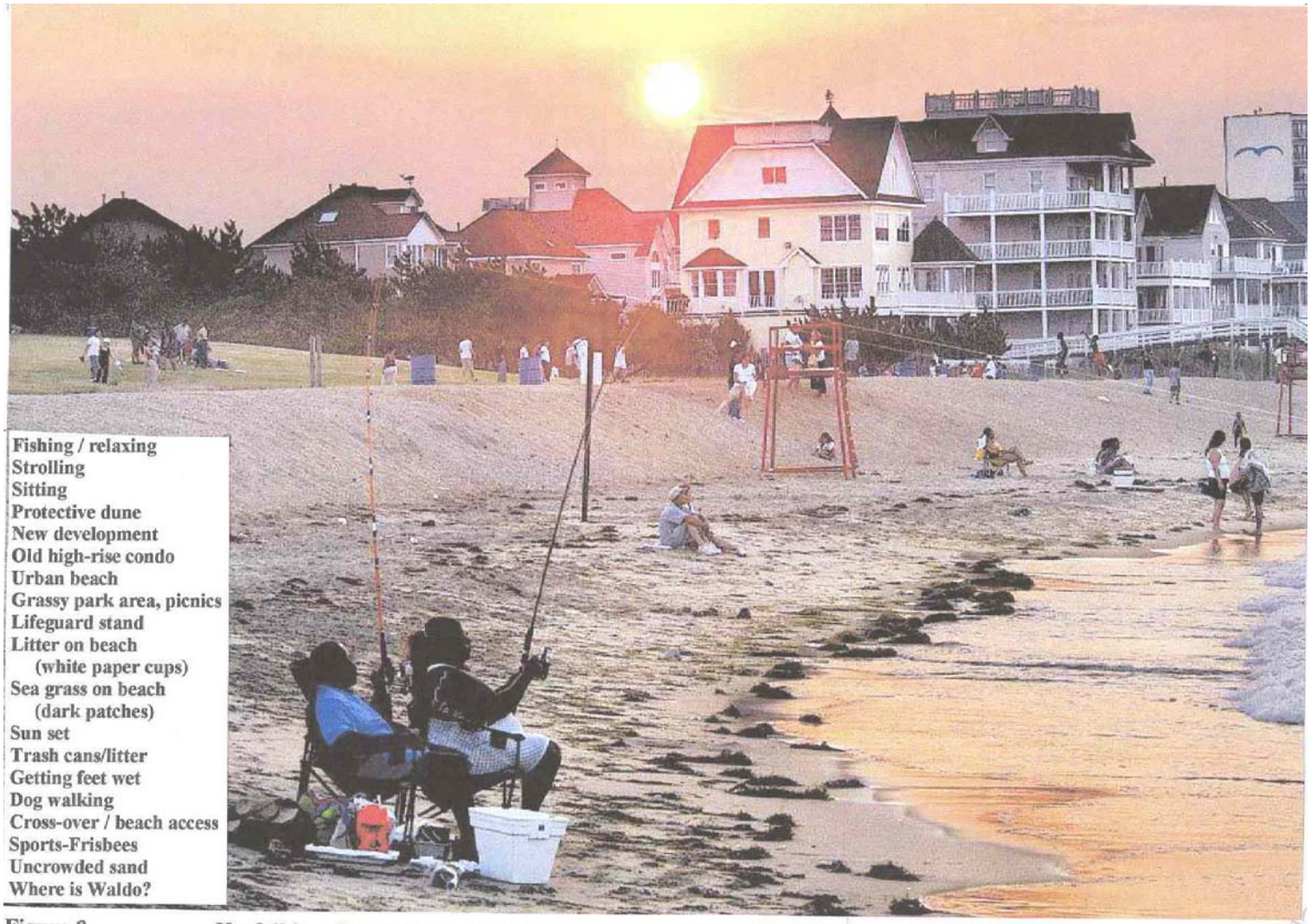

Figure 8 Norfolk's urban beach at East Ocean View. How many of the items listed can you spot? (Source: Virginian–Pilot, July 30, 2005, Mort Fryman)

"walking-the-beach" after dinner on a warm summer evening "at-the-beach."

Table III – Beach Nourishment Costs (Before ISABEL, 2003) and Storm Damage Prevention Benefits (ISABEL, 2003)

City / Federal Gov't (Beach)	Nourishment Cost, $ Before Sep. 2003	Storm Damage Benefits, $ ISABEL (Sep. 18, 2003)
Virginia Beach **(Oceanfront)** **(Sandbridge)**	 $125 million $ 10 million	 $82 million $23 million
Norfolk **(Ocean Park)**	 $ 6 million	 $ 5 million
Hamptom **(Buckroe)**	 $ 4 million	 $ 3 million
US Navy **(Dam Neck**	 $ 7.5 million	 $18 million
Totals	$152.50 million	131 million

2.6 Summary

Critics of beach nourishment argue that it encourages development, and protects the property of the rich (and few), and the building of structures (hotels, restaurants, infrastructure, etc.), which results in high damage costs from future storms.[24] This would be true on the relatively pristine Eastern Shore barrier islands but not for the regions' shorelines where many people have lived (and not just the rich) for hundreds of years. The key issue is distance of the structures from the shoreline as demonstrated in Figure 5. Studies have proven that it is more economic to increase this distance by beach nourishment than by relocating the structures further from the shore (retreat).[25-27] Virginia presently does not have a Coastal Construction Control (setback) Line as in Florida (Fig.5) to prohibit new construction too close to the ocean.

Does beach nourishment work? If success is measured in terms of the tourist impact benefit for the region's economy, then the answer must be *yes* for business, personal income, and the governments of the region. Beaches ***generate*** money for the region. If success is measured in terms of storm damage reduction, then the answer must also be *yes* for ***saving*** money in the region.

Beach nourishment does work in the region.

Section 3
Does It Hurt (or Help) the Environment?

3.1 Environmental Impacts

A relatively new criticism of beach nourishment is that it is harmful to the ecosystem at the site, in the borrow area, and on adjacent beaches. [28] The food chain begins with the tiniest organisms living in the spaces between the sand grains (Figure 9) and then grows to include the worms, crabs, sea turtles, marine mammals, fishes, shore birds, and the physical habitat (plants and grasses) that comprise the ecological system. Because many beaches are nourished by pumping sand from offshore resources by dredges, this operation may create turbidity clouds, capture and kill turtles, and modify the underwater and on-land habitats in both diversity and numbers of species normally living at the coast.[26]

Some of these aspects may be short-lived and not harmful to the local environment. For example in our region, extremely fine-grained sediments make up only a small fraction of the borrow material; the resulting turbidity during dredging is low; and no living coral reefs exist nearby to be smothered by these events. Federal (EPA, Corps, Fish & Wildlife) state (VMRC) and local (Wetlands Boards) collectively review beach nourishment permit applications. The critical concerns locally are the sea turtles protected by the Endangered Species Act.[29, 30]

3.2 Sea Turtles and the Regions' Beaches

Four species of sea turtles (Kemp's ridley, leatherback, hawksbill, and green) are on the National Marine Fish Service list of endangered species in the region[30]. The loggerhead is considered a "threatened" type. To minimize impacts, monitoring on board the dredge for incidental takings of sea turtles is required from May 1 to Nov 30 and the dredge must have turtle deflection (Figure 10) and screening devices. The time window for dredging the regions sandy resources is year around.[29]

Daily turtle nest surveys on the beach are required if construction occurs between May 1and Aug 15. If a turtle nest is discovered, the eggs are relocated away from the beach nourishment location[29]. Many studies in

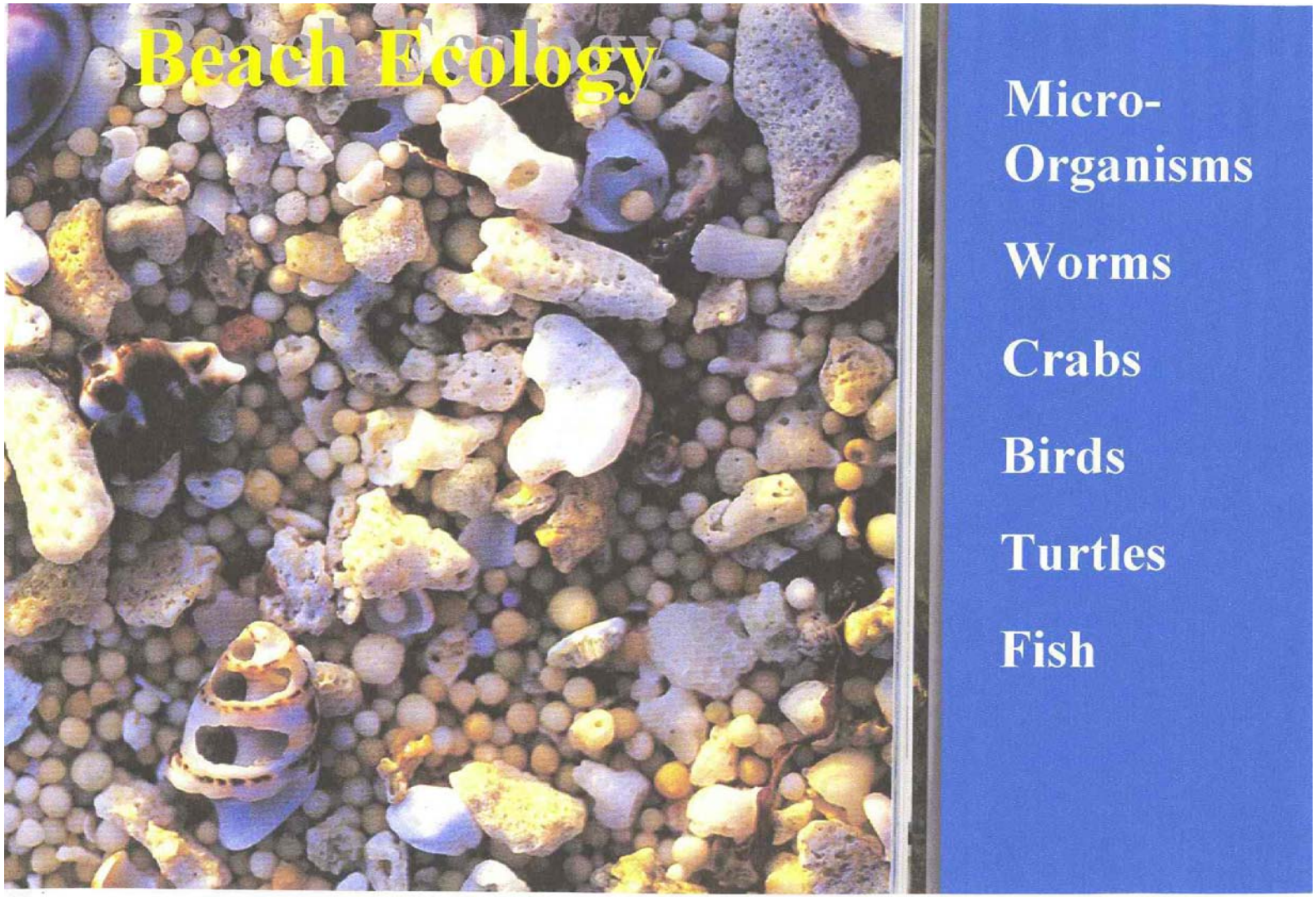

Figure 9 **Beach ecology starts with microorganisms living within pore spaces (air, water) between sand grains on the beach and continues up through the food chain to the worms, crabs, birds, fish and animals that need each lower level to survive.**

Figure 10 **The turtle deflector device on one drag head of the US Army, Corps of Engineers' hopper dredge McFarland to move bottom resting turtles away from being sucked into the dragarm and into the hopper. (reference no.80)**

Florida[31-36] and around the world[37] have shown that in later years, a renourished, wider beach provides more habitat space so that turtle nests and turtle egg numbers are higher. On Monday, Aug 5, 2005, a rare, green sea turtle laid 124 eggs on the southern Sandbridge beach where summer, vacation homes exist. It was the first ever, documented case for a green sea turtle in Virginia.[38]

The region's beaches are also found at the National Wildlife Refuge (Fed property) False Cape Park (state property), and military bases (Dam Neck, Fort Story, etc.) so that the space available for turtle nesting is much greater than the 26 miles of public beaches in the region.

Increased noise, light, and beach usage may decrease the numbers of nests and eggs. Poor water quality may also harm sea turtle nesting.

3.3 Water Quality and "Blue Flag" Beaches

"*When it rains you don't go to the beach, your litter does*" is a popular slogan in Europe to discourage littering (Clean Streets/Clean Beaches). Rainfall washes the streets, flushes oil, animal feces, etc. through the storm sewers and into the oceans, bay, and tidal rivers of the region.
Some storm sewers drain polluted water directly onto the beach. Recent efforts in Virginia Beach are funneling the runoff into pumping stations to send it far offshore in large pipes that can also handle flooding from coastal storms.[39]

Water treatment plants for municipal wastewater significantly improves the water quality found on the bathing beaches in the region. The EPA has begun water quality monitoring efforts at public beaches around the country. However, the US is far behind in this regard. Figure 11 displays the "Blue Flag" flying at a beach in Europe to demonstrate that this beach meets all the "standards" necessary to qualify, namely: (1) water quality (2) environmental management (no broken glass, etc.) (3) safety (lifeguards) and services (toilets, showers, changing rooms, etc.) and education (signage). In 2006 over 3100 beaches in 36 countries (Europe, South Africa, Morocco, New Zealand, Canada, and The Caribbean) participated in the Blue Flag campaign.[40] Some of these concerns are also discussed in the section on beach management below**.**

Figure 11 **The Blue Flag displayed at a beach in Turkey to signify that the beach meets the four criteria (e.g. water quality, environmental management, safety and services, and education) required at levels acceptable to standards established by the Blue Flag Campaign (http://www.blueflag.org). The Clean Beaches Council (http://www.cleanbeaches.org) currently runs the Blue Flag program in the US.**

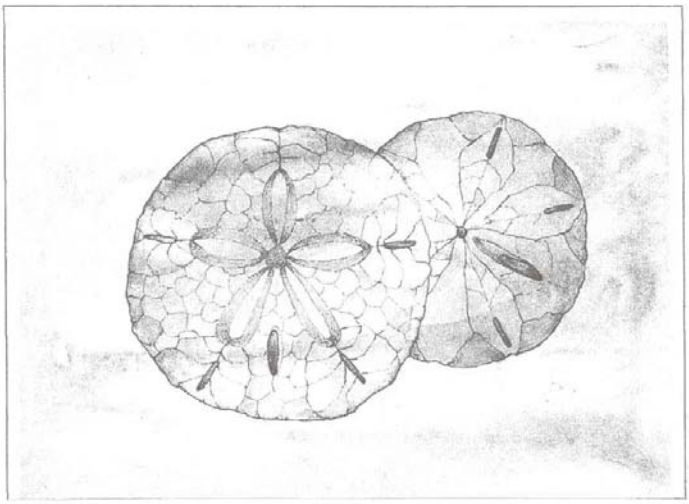

Figure 12 **The Mellita quinquiesperforata is the scientific name for the five-hole sand dollar, the most common species found on southeast beaches. These fragile, flat discs with five, keyhole slots near the edges of the shells are beautifully designed. They almost always live below the low-tide elevation on sandy beaches. They belong to the Class Echinoida, which includes sea urchins. (reference no.81)**

3.4 Summary

The regions' joint permitting process (Corps, Virginia Institute of Marine Science, Wetlands Boards) insures that all beach nourishment projects are scrutinized for possible harm to the environment. Clean, wide sandy beaches increase habitat for turtle nesting and eggs are relocated when found by routine inspections during beach construction.

Monitoring of water quality at the beach is just beginning. Little research has been conducted to understand what happens to the micro-organism (biota) in the pore spaces. One study by the VIMS[41] in the 1980's discovered that the diversity and numbers of biota in the offshore borrow area were quickly re-established (days) following sand dredging in the Chesapeake Bay to nourish Buckroe Beach. This was a surprise finding and it demonstrates the rapid adaptation of microorganisms. However, our understanding of the microorganisms living on a sandy beach remains the weakest link. Much more research is needed to understand what is happening before, during, immediately after and years later at a nourishment project.[42] Success (or failure) for the environment is difficult to quantify in economic terms. While environmental concerns exist, the biggest concern is cost. Figure 12 displays one of the most faithful symbols of the seashore, and a few dried specimens are often found in the vacationer's beach bag. The common name is Sand Dollar. Its' name is symbolic of the most important concern regarding beach nourishment.

Section 4
Who is Going to Pay for Beach Nourishment?

4.1 Basic Guiding Principles

It is important to keep in mind the following basic factors when addressing the question of who pays?

(1) Sand moves continuously along the region's shorelines and recognizes no political or property boundaries, or laws;
(2) Sandy beaches are a natural resource (like fresh water, timber, minerals, etc.) that requires stewardship and management for the future;
(3) Who pays if nothing is done and what is the cost if the beaches are not "managed";
(4) Who benefits should guide who pays;
(5) Our region's beaches do not include the barrier island chain on the Eastern Shore nor the Outer Banks of North Carolina; and
(6) No taxpayer money (Federal, state, local) can be spent to nourish "private" beaches.

It is also important to have in mind some basic knowledge of sand nourishment costs.

(1) Unit costs are relatively low averaging $5-7 per cubic yard (cy). (Home owner costs for a truck load of a "few yards" are 4-5 times higher per cy.
(2) Large volumes are needed to be effective in both width (50 – 300 ft wide) and length (1000's of feet to miles).
(3) Public beaches are "infrastructure" like roads, bridges, utilities, ports, etc. that require periodic maintenance and even upgrading as "usage" increases.
(4) Total costs include both initial construction cost and long-term maintenance expense that add up to millions of dollars over the "economic" life-time (25-50 years)

4.2 Common Perceptions of Nourishment Costs

Three often heard arguments against beach nourishment are:

(1) It's waste of taxpayer money (Federal, state, local).
(2) Half the new beach is washed away after the first storm (throwing money into the sea)
(3) It is an endless expense.

These are often summarized under the refrain "You can't fight mother nature." We herein primarily focus on the first concern since everyone does not want to see tax dollars wasted at all levels of government.

4.3 Federal Beach Nourishment Projects of the US Army, Corps of Engineers

The present cost sharing arrangement authorized by Congress is 65% federal share and 35% for the "local" (state, country, city) share.[43] Is the 65% federal share a wise investment or waste of average US Citizen (e.g. Peoria, Illinois) taxpayer money? Does the federal government benefit under the guideline, "*who benefits guides who pays?*

Presently, ONLY storm damage reduction benefits are allowable to justify the federal governments' share. Each authorized project must contribute to National Economic Development (NED) and follows "Principles" adopted by the Water Resources Council in 1983.[44] Consequently, all other benefits (tourism, property value, recreation, environmental enhancement, etc.) CANNOT be used to justify Federal expenditures in Corps of Engineers projects.

The Federal Government benefits from beach nourishment projects that have been carefully planned, authorized, funded, constructed, and maintained in two basic, yet fundamentally different ways.

4.3.1 Saving in Wake of Coastal Storms.

When disaster strikes the coast in the form of hurricanes and northeaster storm events, the FEMA responds to Presidential Disaster Declarations with authority to quantify damage and pay for cleanup and rebuilding.[45] Funding comes from the Federal Treasury. The call for help is initiated by local officials and the governor of each State. The media gives much attention then moves on to other "news". But clearly, the old adage of "no news is good news" applies for locations where storm damage mitigation (reduction)

efforts have been made. Wide, nourished beaches significantly reduce the need for disaster funding from FEMA and the Federal Treasury.

Since "natural" disasters of all types (hurricanes, earthquakes, tornados, forest fires, etc.) can impact the lives of all US taxpayers, Federal money for disaster recovery is favored and expected. Conversely, US Army Corps of Engineers projects are often criticized and grouped with "pork barrel" efforts of the US Congress (Figure 13a) even though they *save* taxpayer money in the long term.[24]

We herein introduce the term "piggy-bank" project to clearly separate them from the "pork-barrel" image and perception (Figure 13b). Most US taxpayers understand from childhood, the value of putting a little money in their piggy-bank for use later in time or for a "rainy day". Table IV summarizes the differences between "pork-barrel" efforts "*earmarked*" by Congress and "piggy-bank" projects *authorized* by congress.

Table IV - Attributes of Federal Government Pork-Barrel projects or Piggy-Bank Projects of the US Army, Corps of Engineers

Pork-Barrel	Piggy-Bank
1. Initiated by single member of Congress.	1. Initiated by Fed Agency (e. g. Corps of Engineers) with local review, cost sharing, priority setting, Benefit/Cost analysis.
2. Benefits to specific site, small group of users.	2. Benefits to Federal Government, States, local citizens over long term.
3. Attached as add-on to other bills of totally different intent, often hidden, last minute	Part of long-term process of Energy and Water Resources Comm. through Legislature process of Authorization and Appropriations, totally open process, in lime-light, not hidden.

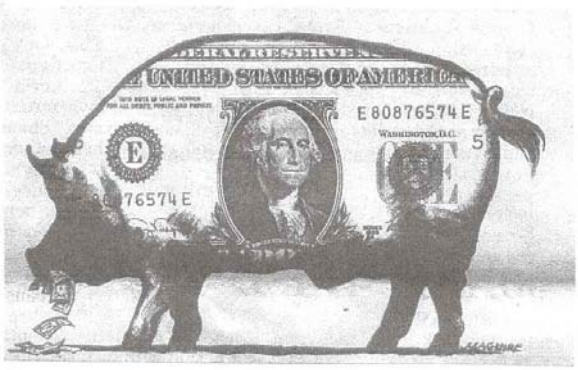

Figure 13 (a) **One symbol of excessive, "pork-barrel" spending by the Federal government. Spending dictated by individual legislators for specific projects is called "earmarking."(Copied from George Will's column as distributed by the Washington Post Writers Group ,Feb 12, 2006, with graphic signed by "Maguire").**

Figure 13 (b) **A new symbol to distinguish "piggy-bank," government spending as determined by a government agency with local government cost sharing, benefit/cost analysis, etc. as summarized in Table IV.**

The recent tragedy in New Orleans that resulted from Hurricane KATRINA is still under investigation. Many "reasons" are bandied about that cover all science/engineering, economic, environmental, social/political/institutional, and aesthetic factors that caused the disaster. But the clear fact so far is that over $108 billion in Federal, Emergency Disaster funding will be needed to even partially recover.[46] Back when the flood protection levees were authorized and constructed, and then again when maintenance and improvement funding was requested, some labeled these Corps of Engineers project requests as "pork-barrel" efforts by the members of the Congress from Louisiana.[47] As a nation, we must be smart enough to differentiate between both PB-type projects and act accordingly.

Clearly, beach nourishment projects are the "piggy-bank" type. Initial construction costs and maintenance expenses over time are invested in the beach to be ready when the "rainy days" come and disaster strikes the coast. To do otherwise is like another old adage "penny wise and pound foolish".

4.3.2 Earnings from Foreign Tourists.

When visitors come to our region's beaches from Canada, Europe and other foreign countries, the US Government benefits by increased tax revenues.[48-50] Foreign visitors to the US produce an annual trade **surplus** over $15 billion and greater than any trade component including agricultural exports. The US trade deficit for FY 2005 was $ 726 billion.[51] French-speaking tourists from Canada especially enjoy the relatively less populated beach houses at Sandbridge. Spending by foreign tourists supports many beach related jobs that have a ripple effect on the local economy. For example Miami Beach was nourished in the late 1970's and beach attendance almost tripled. Foreign tourists spend $2.4 billion annually, which is 500 times the annual cost for maintenance.[4] The earnings of the Federal government from foreign tourist visits to our region's beaches are unknown.

The Federal Government does not include tourism (and recreation) benefits to justify Corps beach projects because US beach tourists (e.g. from Pittsburgh) can choose any US beach so there is no net economic gain to the US treasury. The 2004 Virginia Beach Visitor Profile[52] gave the following:

- Average travel distance is 416 miles

- Two largest metropolitan areas mentioned were Washington, DC and Richmond, VA. One-third (1/3) of the visitors were from these areas two regions.
- About two-fifths (2/5) travel greater than 300 miles.
- Over 30% come from Virginia with Pennsylvania the next largest number.
- About 60% brought children along.
- The most common length of stay was 3 days (21%) with next being 7 days (16.60%).

However, the Federal government does benefit from foreign visitors. The Visitors Profiles revealed that the numbers from Canada are increasing each year.

4.3.3 Federal Funding of Beach Nourishment.

Although US taxpayers save money and the US treasury earns revenue through the wise, long-term investment in beach nourishment projects; there is no National Beach Management Plan. Each year for the past 20 years, the President's Office of Management and Budget (OMB) has recommended greatly reduced budgets for Corps projects and the Congress has then fought over how to restore funding to levels averaging around $100 million per year. For some perspective, the annual Federal government expenditure to combat forest fires is over $ 1 billion.[53]

Virginia Beach has been very successful over the past 50 years in part due to our political representatives in the Congress; and now continuing in the future at both the Resort Beach and Sandbridge.[54] Table III also displays the costs of beach nourishments projects with those of Virginia Beach being total dollar amounts (65% Federal, 35% Local). The City of Norfolk and the Corps are now studying and developing a plan for a joint project. Beach nourishment costs for Norfolk (Ocean View) and Hampton (Buckroe) listed are all from local funding[21, 22] – no federal money. Storm damage prevention benefits during Hurricane ISABEL (Sept. 18, 2003) are near or even greater then the project costs for just this one – albeit major storm event.

A large, backlog exists of authorized, but never funded beach nourishment projects at the national level.[55] All have benefit/cost (B/C) ratios much greater than 1.0 meaning each year the annual damage prevention benefits exceed the annual nourishment costs. Critics of the Corps argue that the benefits are inflated and the costs understated. Critics call for lowering the

cost share ratios to 50/50% or even 35/65%, 0/100% with the local's paying more, and more, or all of the beach nourishment expense.[24, 25]

The present cost sharing formula, 65% Federal, 35% local governments (city, country, state) remains the law. Clearly, US taxpayers save money from the Federal Treasury to recover from storm disasters and this same Federal Treasury earns money from foreign tourism. It can be concluded that beach nourishment is not a waste of US taxpayer money and the Federal Government must be involved because of the national economic benefit. Beach sands deposited at Virginia Beach, and Sandbridge, and Dam Neck spread along the shoreline to maintain other cities (Norfolk), state (parks) and federal (parks) and military property beaches.

The Federal Government should continue its' responsibility for maintaining the region's beaches in the future in Hampton Roads.

4.4 Is Beach Nourishment a Waste of Local (City, State) Taxpayer Money?

The local government's share (35%) in joint projects authorized by Congress considers all other benefits (e.g. tourism, property taxes, jobs, recreation, etc.) as well as storm damage reduction benefits. Justification for spending State income tax dollars and local property tax dollars is the same as detailed above for the federal share, but now also includes all these other benefits. For US tourists, the State's beaches compete with neighboring state beaches and resort areas in Maryland, North Carolina, etc.

However, over the years many beach nourishment efforts have been fully funded (100%) by local (city, state) governments. These are generally smaller scale and sporadic projects. To aid these efforts, in 1980 the Commonwealth of Virginia created the Board on Conservation and Development of Public Beaches, (herein called the Public Beach Board). A matching grant fund was established to help "…local governments to conserve, protect, improve, maintain, and develop" the 29 miles of tidal, public beaches in 14 cities and counties (Figure 2). To qualify, the sandy strip of shoreline must be "publicly owned" by the locality and accessible to the general public.[56]

Over the 20-year period, 1980-1999, nearly $8.5 million in matching grant, state funds from the Public Beach Board were allocated to local governments for their beaches.[57, 58] The annual average budget was around $425,000 per year, but not every beach received funding each year. This was about $2.75 per foot state funding each year for Virginia's beaches. By contrast, Maryland spends $45 per foot annually for the Ocean City Shoreline.[57] In 2000, the Public Beach Board was transferred within the Department of Conservation & Recreation of the Commonwealth. And, since 2000, the Public Beach Board has received zero funding for its' matching grant program.[59] At this writing, the future of the Public Beach Board is not certain.

The "who benefits guides who pays" principle is clearly missing from the State Treasury in the Commonwealth of Virginia. The last published document by the Public Beach Board was Senate Document No. 32 in response to Senate Joint Resolution (SJR) No. 338 of the General Assembly of Virginia (Dec 1997).[57] In 1996, the City of Virginia Beach returned $88 million (70.10 %) in sales tax revenue to Richmond as a result of 1996 sales tax receipts. Approximately, 2.2 million, out-of-town visitors came to Virginia Beach in 1996 so that a large percentage of the State's sales tax revenue from Virginia Beach was due to beach tourism.[57]

Since the early 1980's the State of Florida appropriates about $50 million each year for State participation in Corps projects and for 100% State funding of other projects.[60] In New Jersey, the annual, dedicated funding of beach projects is $15 million. The annual funding comes from added fees to every real estate transaction, not from taxes in New Jersey.[61] As mentioned above, since 2000, the Commonwealth of Virginia has invested zero dollars in its beaches.

The "who benefits guides who pays" principle has been used in the City of Virginia Beach for many years. The sales tax was 1¢ higher and known as the "Sand Tax" with the extra funds employed generally to maintain the beaches for the tourist season. In 1995, the Sandbridge Beach subdivision was established as a special property tax district to generate revenue needed to supply the local, 35% share for the Corps of Engineers, Federal Project.[5] The property tax rate in Sandbridge is $1.1439 per $100 assessed value, i.e. 12 cents or 11.72% higher than the rest of the City. A second, funding source is the extra 2.5% tax on property rentals at Sandbridge.

As mentioned above, the first beach nourishment project at Sandbridge took place in the summer of 1998.[62] For the six-year period, 2000 – 2005, assessed property values have risen from $240 million to over $605 million (250%, 18% per year average) In contrast, the city wide property assessment increased, on average % per year during this same period. The special tax district fund has now grown from $0.95 million to over 2.1 million in 2005 for Sandbridge. Clearly, the City of Virginia Beach and its' Sandbridge sub-division citizens are doing their part to pay for the costs of beach nourishments now, and whenever required in the future. Criticisms from State residents (e.g. Roanoke) or City residents (e.g. Kempsville) that their taxes subsidize rich, beach residents on Virginia's oceanfront are unfounded.

Recently, the residents of Dare Country, North Carolina (about 65 miles south of Virginia Beach) voted *against* an increase of 1¢ per dollar in the local, state sales tax.[63, 64] The extra funds were to help pay for needed beach nourishment efforts in the county. Many "reasons" were mentioned in the media for the vote *against* the local sales tax increase, e.g.

- only the rich, oceanfront properties benefit
- sales taxes and rental property taxes presently are enough to pay for beach nourishment
- local residents do not want to attract more tourists to the Outer Banks of North Carolina

Consequently, increases in oceanfront and county-wide property taxes are being considered.[65] Unfortunately, storm damage reduction benefits of beach nourishments received little, if any mention in the Dare County debate.[63] Without beach nourishment, Dare County remains highly vulnerable to coastal storm damage due to beach erosion. State Highway 12 was breached in Hurricane ISABEL.[66] Lifeline services (fire, ambulance, police) and school buses were cutoff for many weeks until the breach could be closed and Highway 12 rebuilt.[67] A beach nourishment project to project Highway 12 from future breaching is needed.[68]

What happens if nothing is done to ward off the effects of beach erosion? Researchers at the University of Delaware estimated that with normal erosion rates over 50 years, the cost of *not* protecting Delaware's ocean beaches is almost $300 million.[69] The "benefits" of beach nourishments on the regions beaches to mitigate the effects of Hurricane ISABEL in September 2003 are detailed above in Table III.

The beaches in Virginia for tourism, storm damage reduction and recreation are too valuable to the Commonwealth to be zero funded in the annual state budget. The Commonwealth treasury clearly benefits and therefore should also contribute to the costs of beach nourishment projects each year.

4.5 Is Beach Nourishment Half Gone After the First Storm?

Figure 14 displays the cross-section of a typical beach nourishment project. The horizontal axis is distance (feet) across the beach and beneath the waves offshore. The vertical axis is the elevation of the beach and water depths offshore relative to the mean water level. The original beach profile (red) and equilibrium, new beach profile (black, adjusted) are also displayed. The most economical way to construct a new beach is to pile the sand up on the beach and at a steep "construction" slope offshore (green). Then, to let the natural tidal elevation changes each day and waves move the sand offshore until a new, adjusted "equilibrium" profile is attained (black). This "equilibration" process takes about one year when winter (storm) waves and summer (swell) waves have been at work on the construction profile. The design beach width (black, adjusted) that results is about 50-60% of the original construction width. Beaches are always constructed wider than designed for this reason. The media who visit the newly constructed beach width and then return after the first winter storm see a much reduced beach width for this reason. The beach is NOT "half gone" after the first storm. The sand has moved offshore and is redistributed to the new profile shape (black) as designed.

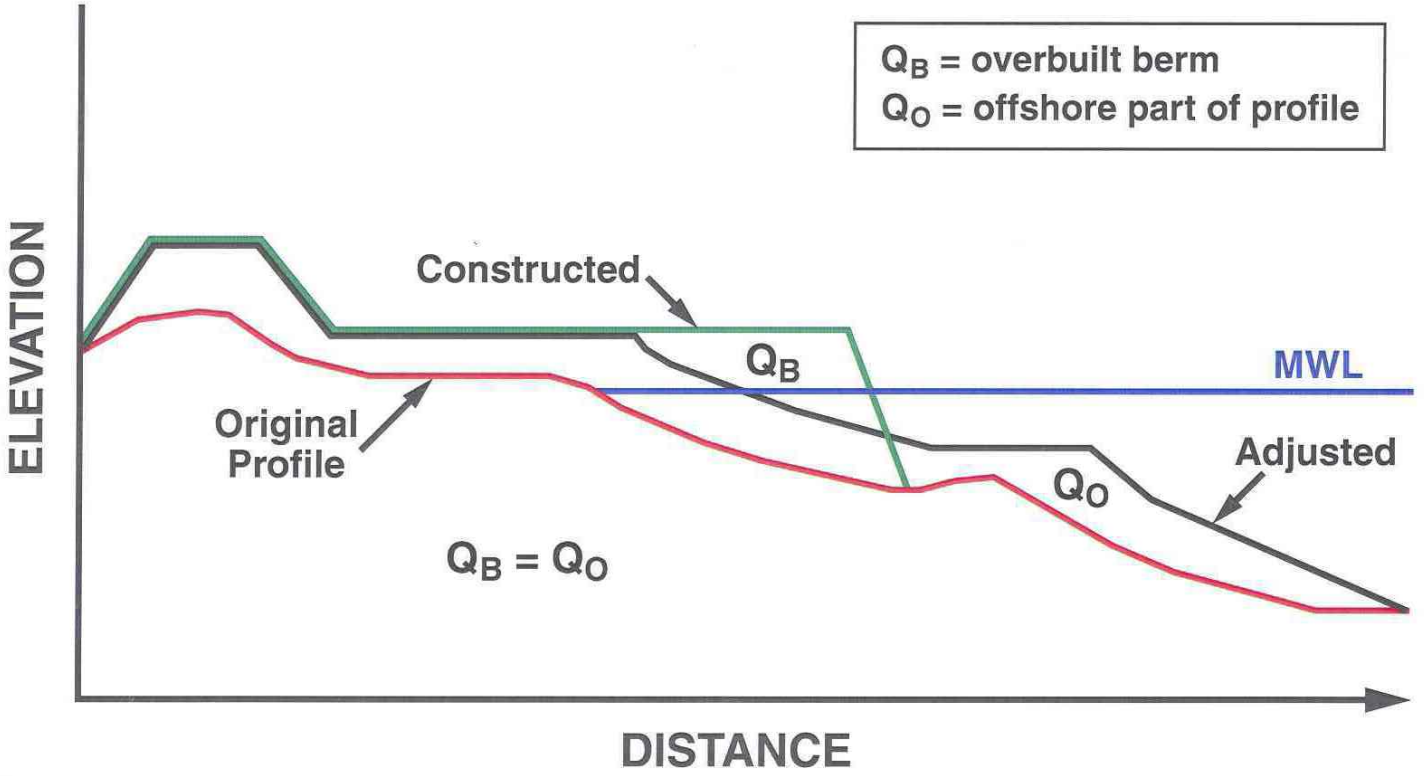

Figure 14 The newly constructed beach cross-sectional profile (green) with steep offshore slope is much wider than the design beach width after nature's tides and waves adjust the slope (black) to natural conditions. As a result, after one-two years of adjustment the design beach width is roughly half as wide as the constructed width. The beach is not "half gone" after the first storm. The sand has been redistributed offshore to form a new profile (black) that mimics the original profile (red).

To design and work with nature, coastal scientists and engineers must first understand how nature works. The criticism that beach projects don't last is not justified when considering only the initial construction width and not understanding the ultimate design width. The coast is a harsh environment. Nothing lasts forever.

4.6 Is Beach Nourishment an Endless Expense?

Finally, critics of beach nourishment often complain that it "is an endless expense."[70-74] In this regard, all public expenditures of taxpayer money for civilization's infrastructure (roads, water, sewers, garbage disposal, parks, etc.) are also endless. All require annual maintenance expenses and "improvements," when justified. Citizens and tourists of the region drive on roads to get to the beach. The "endless" expense of street, road, highway, etc. maintenance is taken for granted but not for beaches. Only when considering the beach as a natural resource and "infrastructure" can the true economic value of beaches be placed in proper perspective. Beaches also need annual maintenance and periodic upgrading to continue to function as the generator of federal, state, and city revenues from the tourist industry and as the saver of taxpayer money by storm damage reduction. Recent indications are that the hurricane intensities will increase in the near future. Speculation also abounds that sea levels will rise at higher rates in the near future. For both, wide sandy beaches are presently the only environmentally and economically viable alternative to reduce the damaging impacts of storms to man's activities at the coast.

Yes, beaches are an endless expense but also provide an endless source of benefits for taxpayers and governments at all levels.

4.7 Summary – Who pays for beach nourishment?

The underlying goal is fairness when applying the basic principle, "who benefits should guide who pays." All US taxpayers (Federal, state, local) benefit by maintaining wide, healthy sandy beaches. Therefore, all levels of government must share in the expense. Education is needed for the general public from inland States (e.g. Peoria, IL), inland areas of states (e.g. Roanoke, VA), and inland areas of coastal communities (e.g. Kempsville, Virginia Beach) to understand how beaches save taxpayer money from storm damage and earn government revenue from tourists taxes and jobs.

The distinction between "pork-barrel" and "piggy-bank" projects at all governments levels would help most citizens understand the long-term usefulness of beach maintenance costs.

Funding sources at the three government levels (Federal, state, local) are summarized in Table V.[75] The region's beaches are benefiting by funds from both the federal and local governments but receive zero funds from the state. The Commonwealth of Virginia needs to develop a dedicated, annual fund to enable the Public Beach Board to resume its role to aid all the public beaches in the region. Without it, the beaches in the region will suffer in the long run.

Table V - Funding Sources for Beach Nourishment at Federal, State, and local government levels

A. Federal Treasury
   1. Direct Expense – Department of Defense
      a. Civil Works Projects, US Army, Corps of Engineers
         1. Authorization, Water Resources Development Act.
         2. Funding, Water and Energy Bill
      b. Military Projects
         Base budgets
   2. Indirect Expense – Department of Interior
      a. FEMA, Emergency, beach restorations projects
      b. FEMA, Presidential Disaster Declarations

B. State Treasury
   1. Direct Expense – Department of Conservation and Recreation
      Public Beach Board
   2. Indirect Expense – General Revenue

C. Local Government
   1. Direct Expense – City of Virginia Beach
      a. Additional 1¢ Sales Tax – "Sand Tax"
      b. Special Property Tax District – Sandbridge
   2. Direct Expense – Other Region Cities
      Unknown
   3. Indirect Expense – General Revenue

Yes, like all other coastal infrastructure (roads, utilities, fire/police protection, etc.) beach maintenance is an endless expense. But it is also an endless source of income, storm protection and a recreational resource for the citizens of the region. Beaches provide endless benefits. The region's benefit to cost ratio (B/C) is much higher than 1.0 using factual costs for construction and maintenance and factual data for benefits as discussed above. Consequently, beaches require proper management.

Section 5
Who Manages the Region's Beaches?

5.1 Management Issues

Beaches are a natural, mineral resource that needs careful management that can be summarized under four topics:

- Social, political, institutional
- Physical
- Economic/Finance
- Environmental / Aesthetics

The degree of beach management for our region within each of these four topics is addressed below.

5.2 Social, Political, Institutional Issues

5.2.1 Institutional.

The Office of Beach Management in the City of Virginia Beach; the Waterfront Bureau and Environmental Services in the City of Norfolk; The City Planning and Parks Departments in the City of Hampton and the Public Works Department City of Newport News all provide a long history of institutional identity for beach issues in the region. Council members and citizens generally know where and who to turn to for information and to voice questions and concerns. Web sites from these cities keep active, up-to-date information regarding their beaches. Unfortunately, at the state level in Richmond, Virginia's Public Beach Program is no longer viable since it has been zero funded since FY2001.[76] Under the States' Department of Conservation and Recreation, Soil and Water Conservation Division the web site on public beaches is out-of-date.[77]

Focus in Virginia has been on shoreline erosion around the Chesapeake Bay but not on the Bay and ocean beaches. In contrast, the State of Florida has a Bureau of Beaches and Coastal Systems employing over 50 full-time scientists and engineers within the states' Department of Environmental Protection.[78]

5.2.2 Political.

In general, over the years, the regions' representatives in the US Congress and in the Military understand the value of the region's beaches for storm damage reduction. For example "…sand replenishment funds for local communities are a vital defense against storm damage. They are part of the Corps of Engineers' flood control mission to protect property, public infrastructure, and human lives" (Press Release, Congresswoman Thelma Drake, Nov 9, 2005).[54] The local cities' mayors and council members also understand and do a fine job to inform local residents on the value of their beaches.

The Virginia General Assembly for 2006 includes 8 senators and 16 Delegates representing South Hampton Roads. Little or nothing is ever discussed in the media by these State Representatives in government regarding the region's beaches. It's an issue that does not register on their "radar screen." Transportation funding is the key budget issue. Someday (perhaps soon) when it is learned that beach tourists are avoiding Virginia because of the problems getting to and around Virginia Beach because of the clogged roads, then (perhaps) funding to improve local transportation will be supported by political leaders of both parties.

5.2.3 Social.

The region's beaches are urban parks for recreation. Consequently, parking, beach access, restrooms, safety, lifeguards, and sports facilities are all of concern (Recall Fig. 8). Most of the needs are met satisfactory by the cities. In general, however, more public restrooms (permanent or temporary) are needed, especially on the North end of Virginia Beach frequented by local residents. Also, the need exists for public changing rooms and shower facilities for local residents. It should be possible to spend the day at the beach, shower, and change into evening attire for dining at a nearby restaurant. These facilities are routinely provided in most states, but not in our region.[78, 79] Fees to provide this service could be collected to pay the costs. A common complaint voiced is that the cities cater to summer tourists while forgetting about the year-around needs of local residents.

In Figure 2, three beach areas on the Chesapeake Bay within the City of Virginia Beach (Chesapeake Beach, Baylake Beach and Cape Henry Beach (some parts)) have unclear property ownership issues.[5] However, the general public has had full use of these beaches for many years. But long-term

erosional trends and shoreline recessions (sea level rise) have extended platted boundaries on bayfront property deeds across the beach and underwater. The beach is claimed as private property by adjacent residents. Until the beach ownership issue is resolved, expenditure of public funds for beach nourishment is not allowed. As a result, upland residents remain at high risk to damage from coastal storms.

In summary, the lack of a beach-oriented group within state government and political leadership in the States' General Assembly will negatively impact the region's beaches in the near future.

5.3 Physical Issues.

The present physical condition of the region's oceanfront beaches is excellent. Recent renourishment efforts at the Resort Beach (2002) and Sandbridge Beach (2003) in the City of Virginia Beach and Dam Neck Beach on the Navy Facility (2004) have produced significantly widened beaches to mitigate damages from future storms. And, although no new sand has been directly added to Croatan Beach, natural, northern, net littoral drift of sand from Dam Neck and Sandbridge has added width at Croatan. The new weir jetty at Rudee Inlet also helps retain sand along Croatan Beach.

The situation along the Chesapeake Bay beaches is poor to fair to good. Ownership issues prelude renourishment at three Bay beaches in Virginia Beach as discussed above. They are only in fair to poor condition. Ocean Park Beach is clearly documented as a public beach[5] and receives sand from the Lynnhaven Inlet maintenance dredging project on a 3-4 year cycle, so is in good condition. Norfolk's beaches have for many years included a groin field and recently nearshore, detached breakwaters. Norfolk's beaches are in reasonably good condition behind the breakwaters but only in fair shape elsewhere. Hampton's beaches remain in fair to poor condition after ISABEL. Whether a beach is termed to be in "excellent, good, fair or poor" condition for storm protection is only qualitative unless field data (monitoring) is taken to quantify the conditions.

Periodic measurements of beach elevations at variable distances from a landward baseline (beach profiles) provide data to determine beach widths and volumes of sand on the beach over time. This physical information is then used to determine if the beach is eroding, stable or growing (accreting) in time. When these surveys are taken at many, representative locations

along the beach, the long-term trends can be established for that region of the shoreline. Historic maps with shoreline locations and aerial photographs can extend the data far back in time.

This monitoring of the physical condition of the beach is used to decide when to renourish the beach with sand and determine where local "hot spots" exist (narrow widths) that put landward structures at increased risk during storm events. They also permit documentation to quantify the natural spreading of sand after a beach nourishment project.

Since about 1980, the City of Virginia Beach, City of Norfolk, City of Hampton, Old Dominion University, the Virginia Institute of Marine Science (VIMS), the Corps of Engineers, and the US Navy have separately collected beach profile data for various beaches and sub-beach regions over variable time intervals. The VIMS has done and outstanding job of public beach monitoring and maintains a public beach database for the DCR.[58] But this database is fragmented. The baselines do not match, all the available data is not included, and time intervals exist where no data was taken. There is no state government planning nor funding to support the routine, periodic monitoring of the region's beaches in the future.

A unified, online accessible, database needs to be developed for the region for the available data. This will permit a regional approach to sand management. Proper "management" of the natural sand resource cannot take place without knowledge of past history, present conditions and future projections for decision making. Presently, there, is no state planning nor funding for this database development.

Individual city, military, Corps and VIMS efforts to monitor their beaches are to be applauded and encouraged to continue. But the lack of a coordinated, state-wide effort will mean continued fragmentation of the results making them difficult to obtain and far less useful. There is also no assurance that the data will be taken in the future.

5.4 Economic/Financial Issues

The greatest management concern is economic. How is beach nourishment and maintenance to be financed in the future? Fortunately, contracts for long-term finance (50 years) of beach renourishment costs for the Resort Beach and Sandbridge Beach between the Corps of Engineers and the City

of Virginia Beach now exist. However, the Congress of the Federal Government should appropriate the necessary funds whenever they are required. In recent years, the Administration's, Office of Management and Budget (OMB) consistently opposes the federal governments' statutory responsibility to periodically renourish existing beach restoration projects. Nationally, there was no funding for these existing projects in the President's budget request for FY06. The US Congress however, restored funding in FY06 to permit renourishment on required beaches. Key legislation each year is the Energy and Water Development Appropriation Bill.

The City of Norfolk's current efforts to develop a storm damage mitigation project with the Corps of Engineers that includes beach nourishment is laudable, but faces a tough, uphill battle to gain congressional authorization, let alone, future funding. Again, the OMB opposition to the General Investigation (GI) program of the Corps to begin or continue *studies* of new projects is the problem. The Congress and the OMB will continue to "knock heads" on funding in the future because the nation suffers from the lack of a National, Beach Management Plan.

All the other beaches in the Region (Mathews County, Yorktown, Gloucester Point, Newport News, and Hampton) must now rely solely on local funds since the State's Public Beach Board is zero funded. The $1.5 million in state funding between 1980-1997 will be sorely missed by these cities to maintain their local beaches.

Future financial constraints for the region's public beaches will remain a long-term problem until the Commonwealth develops a dedicated annual funding source.

5.5 Environmental and Aesthetics Issues

5.5.1 Environmental.

Permit applications within the Joint Permit Application process (Corps, VMRC, and Wetlands Board) are routinely submitted by the city involved in beach nourishment. In general, no major management difficulties have arisen todate. Monitoring to meet water quality standards on public bathing beaches for the EPA will require new, beach management activities in the

near future. Understanding of the possible modification of the biota in the borrow site and renourished beach is just beginning and will take sometime before a part of the Permit Application process.

5.5.2 Aesthetics.

The general public's concern for clean beaches has resulted in routine grooming and more receptacles for trash collection at beaches. The annual "Clean the Bay" day and "Adapt a Beach" campaign have encouraged citizen participation. Burial of electrical and communication cables along with landscaping have improved the visual impact for tourists and residents. The new, oceanfront boardwalk along the Virginia Beach resort area (the improved seawall behind the widened beach for hurricane protection) has rejuvenated the area for eating, walking, biking, rollerblading, listening to music and just sitting on the benches to gaze at the surroundings. It would not all be there without the beach.

Section 6
Summary

The economic importance of beaches for recreation, tourism, and storm damage reduction has created the need for beach nourishment projects in the region. Damage reduction benefits of renourished beaches were estimated at over $130 million for Hurricane ISABEL (Sep 18, 2003) alone. The increased beach width following completion of the Hurricane Protection Project in 2002 in Virginia Beach also increased the number of beach visitors to the city. Environmental concerns are routinely addressed in the Permit Process. Yes, beach nourishment does work here.

Using the "who benefits guides who pays" principle clearly shows that all three government levels (Federal, state, city) benefit therefore must share in the expense. Education is needed for the general public to understand how beaches save taxpayer money in storms and earns government revenue from tourist taxes and jobs. The distinction between "pork-barrel" and "piggy-bank" projects would help most citizens understand the long-term usefulness of beach maintenance costs. No, beach nourishment is not a waste of taxpayer money. Like all other public works infrastructure (roads, utilities, fire/police, etc.) it is an endless expense, but also an endless source of income for the region.

The beach is a natural resource that requires careful stewardship. Four key management issues were discussed and we have assigned the following, overall grades to each for our region.

1. Institutional, Political, Social	(B-)
2. Physical (condition, monitoring)	(A-)
3. Economics, Financial	(C+)
4. Environmental, Aesthetics	(B+)
Overall Average	(B)

These overall grades were obtained by assigning individual grades to Federal, State and Local governments for each management issue and then averaging. In each category, Federal and local government grades were A's and B's. At the State Government level, grades were C's, D's and F's and are responsible for the overall, low grades. As discussed herein, the efforts

of the Public Beach Board from 1980-1999 ended in 2000 when it was transferred within the State's Department of Conservation & Recreation and zero funded for the past 6 years. While the Commonwealth of Virginia has benefited from beach related tourism and storm damage reduction, it has not invested any funds to help manage the region's beaches.

Institutional (state employees), Political (state legislature), Physical (state monitoring) and Economics (state funding) constraints to manage the region's public beaches will remain a long-term and growing problem until the Commonwealth develops and funds a Beach Management Plan for Virginia.

Our legacy to our children (Figure 15) must be well-maintained, clean, safe, and beautiful beaches for all to enjoy today, tomorrow, and in the future.

Figure 15 **Dam Neck beach, summer, 2002. Our region's beaches are a treasure and must be maintained for all to enjoy today and as a legacy for our children in the future.**

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