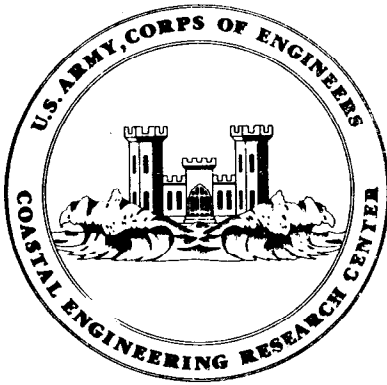


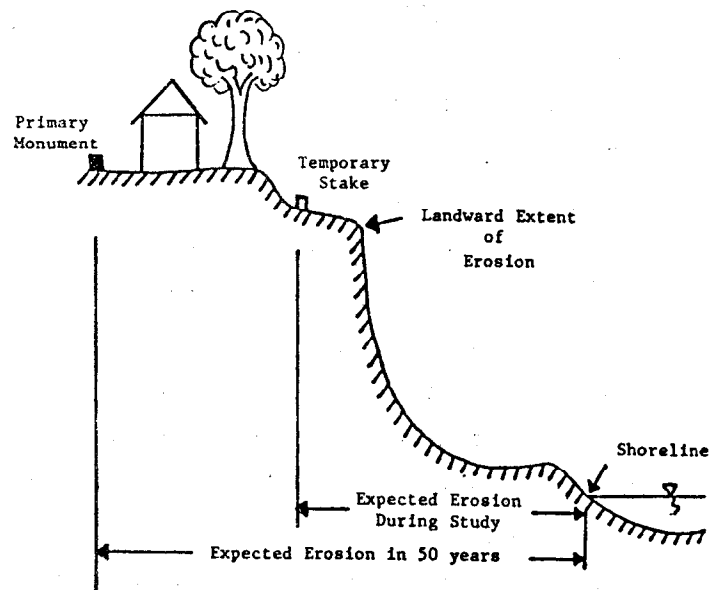


Coastal Engineering Technical Note

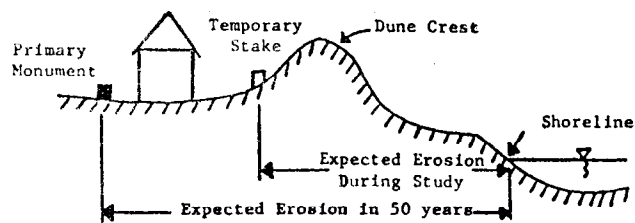
GUIDELINES FOR PLANNING BEACH SURVEYS

PURPOSE: To emphasize the need for: (a) planning the layout and frequency of beach surveys, (b) positioning permanent and temporary survey markers, and (c) using accurate surveying techniques.

BACKGROUND: On Cape Cod, survey monuments established by the Woods Hole Oceanographic Institution in 1953 were reoccupied by U.S. Army Coastal Engineering Research Center in 1970 and still exist 10 years later. These monuments provided a means of obtaining long term records of beach and bluff changes. In a similar study of Great Lakes bluff recession, so-called "permanent" monuments were lost in less than 6 months due to erosion. That not only significantly affected data quality, but compromised the success of any future occupation of the survey lines



BLUFF TOPOGRAPHY



DUNE TOPOGRAPHY

TYPICAL TRANSECT SCHEMATICS

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for long term studies. Many coastal areas such as Cape Cod and the Great Lakes experience periods of high erosion. The difference between the two studies and their respective success and failure resulted from initial foresight and planning. A good series of beach surveys is composed of two parts: documented system of permanent baseline monuments, with horizontal and vertical control; and accurate survey techniques.

PLANNING GUIDELINES: The following are guidelines which should be helpful in planning a program of beach surveys. They are based on many years of experience in performing beach studies. It is important to remember that although a particular study may last only a short time, the monuments and benchmarks may be invaluable 10, 20, or more years after their establishment.

a. Transect Location: Transect or profile lines should be located carefully so that they are both "representative" of the study area, and accessible to the surveyors. Transect spacing should vary depending on the type and complexity of the beach and the purpose of the study. For example, fewer transects are required to measure changes on a long, unobstructed beach than on either a curving beach or a beach with many structures (such as groins, bulkheads, or revetments). Generally it is assumed that a transect is representative or typical of the area midway between adjacent transect lines.

b. Permanent Survey Monuments: Permanent survey monuments which locate either individual transects or a survey baseline should be established well landward of areas of active erosion (see figure). The distance from the high water line should be on the order of 50 times the long term average annual erosion rate for the area. To facilitate easy recovery, permanent benchmarks should be referenced to a number of fixed local features. Since the permanent monument will serve both as a benchmark and a survey marker, its elevation should be based on the National Geodetic Vertical Datum (MGVD) and its location should be tied into the state coordinate system and latitude and longitude.

When selecting the location for the permanent monument, some consideration should be given to future land use. Heavily traveled areas should be avoided; and, if practical, the monuments should be concealed or buried. Permanent monuments should be concrete cylinders or deep

driven steel pipes. In addition, a clear documented permanent record of the location of the permanent monuments should be made (use of DA Form 1959 is recommended).

c. Temporary Stakes: It is not always necessary to conduct a beach survey from the permanent survey monuments or baseline, but it is vital that each survey be tied to a permanent marker. Generally, repetitive surveys should transverse some stable part of the beach profile (dune, bluff), and continue to some consistent ending elevation such as mean sea level (MSL) or mean low water (MLW). It is recommended that each survey start from the same point, located by a temporary stake (see figure). These temporary stakes can be steel pipe or wooden stake and should be located nearer the beach but where they would be expected to last at least the life of the initial study. If they are lost or disturbed, a new stake can be established using the permanent survey monument to which the temporary marker was referenced.

d. Reference Survey: Although most beach surveys will begin at the temporary stake, it is essential that the entire transect starting at the primary monument be surveyed initially and at regular intervals (say annually). The importance of this reference survey cannot be overemphasized. It provides both a check on the position and elevation of the temporary stake and a cross section of the transect which will be needed in the event of erosion landward of the temporary stake.

e. Surveying Frequency: The frequency with which transects should be surveyed depends on the intent of the study, and the speed of the phenomenon being measured. For instance, monthly surveys will provide enough data to look at seasonal changes but are not frequent enough to examine storm changes. Weekly or even more frequent surveys may be required to monitor rapid changes such as those caused by a storm or the initial changes to a beach fill project. The table provides some general guidance on surveying frequency.

f. Surveying Procedure: Use the most accurate surveying method available. Beach surveying is deceptively simple. Since it involves repetitive surveys, small errors will show up and may have a significant impact on measured beach changes. In general, standard surveying procedures using a level to measure elevation and a tape to measure distance are recommended. Acceptable accuracies are the nearest tenth of a foot

SURVEYING FREQUENCY

<u>Tidal Changes</u> -	Every 4 to 6 hours.
<u>Storm Changes</u> -	Depending on storm magnitude - no more than 1 to 2 weeks before and again within 1 to 5 days after.
<u>Beach Response</u> <u>to</u> <u>Construction</u> -	Decreasing frequency starting with weekly, shifting to bi- weekly, and monthly. Surveying should begin when construction is far enough along to affect the beach.
<u>Seasonal Changes</u> -	One year of monthly surveys, minimum.
<u>Long Term Changes</u> -	Five to ten years of semi-annual or annual surveys, minimum.

in elevation and nearest foot in distance. Elevations of benchmarks and turning points should be accurate to the nearest hundredth of a foot.

g. Field Notes: Careful notes should be kept, including remarks as to the date and time of survey and to the location of dune or bluff crest, scarps, the waterline, and sand samples. Photographs are also useful particularly if they are taken at the time of each survey from the same position and direction. Major changes to the area such as recent erosion or construction should also be noted.

SUMMARY: Careful initial planning of a series of beach surveys will insure the success of the project and future use of the transect lines. The important parts to a beach survey program are: carefully sited transect lines, stable and recoverable permanent survey monuments, conveniently located temporary stakes, and periodic reference surveys. Surveying should be accurate and carefully done.