



# Coastal Engineering Technical Note



## TWO-PERSON RAPID BEACH SURVEY METHOD

**PURPOSE:** To describe a two-person beach survey method that can be used in performing rapid, accurate surveys of beach profiles using a two-person survey team instead of the more commonly used three-person team.

**ADVANTAGES:** Permits an increased number of beach profiles to be surveyed with a given number of field team members.

**COSTS:** Job-specific, depending upon number and length of profiles to be surveyed.

**PROCEDURE:** Traditional beach survey methods require a minimum of three people using a surveying level to determine elevation and tape to measure distance. Two-person methods are the stadia method and the Emery method. The Emery method uses the horizon to establish a level line and two 5-ft calibrated poles to measure both distance and change in elevation between successive survey points. Because it is a sequential stepping procedure, the accuracy at each point is dependent upon the accuracy of preceding points; hence, the error cumulative. Moreover, the method requires that survey points be taken every 5 ft, and thus is a very tedious and time consuming restriction on long, flat beaches.

The procedure outlined herein is a modification of standard surveying techniques except that tape measurement is eliminated and distances are determined indirectly by two additional readings of the transit crosshairs (stadia) on the leveling rod. There are, therefore, three readings taken through the surveying level: the top and bottom are used to determine the distance and the center elevation. Because the elevation and distance of each survey point are independently determined, errors are not cumulative as in the Emery method.

An important part of this surveying technique is the simultaneous recording of the number of paces between survey points. Typically, the nature of errors in reading the stadia results in errors in range of increments of the stadia multiplier factor (approximately 100 ft). By recording the number of paces between survey points, it is possible to detect and correct most errors resulting from incorrect stadia mark readings.

Figure 1 and 2 show samples of the field note formats. Note that the foresight readings (FS) are the average of the two adjacent stadia readings. Figure 2 is an example of the reduced field notes. Note that the differences in range correspond approximately to the number of paces between survey points (1 pace equals approximately 3 ft).

The traditional means of communication between the instrument person and the rod person is via a series of hand signals. This form of communication is time consuming and mistakes can easily be made. A desirable alternative is to use a set of inexpensive hand-held, short-range walkie-talkies.

PROFILE 4 FAVORITE BEACH						SMITH X DOE Φ		WIND IS NE 4 PICTURES ROLL 2	
STA.	BS	ELEV.	FS	RANGE	STADIA	PAGES ← PREPRINTED LABELS			
TBM	4.35	16.57		84.0	-9'				
INSTRUMENT LOCATION	1	HI	4.15						2x2 STAKE TOP
	2	20.92	3.35		0				2x2 STAKE GROUND
	3		1.35		9'				INST. STAKE (A)
	4		8.03		*20.3'				DUNE CREST
	5		12.66		12.86				7 - PACE COUNT
TURNING POINT	TP 6		6.49	14.43	15.00				24' (B) ← SAND SAMPLE LABEL
					13.86				
		2.53			2.88				
SECOND SETUP	7	9.02	3.98		0				24' HIGH WATER LINE
	8		3.02		*24.2'				(C) BERM CREST
	9		4.15		*24.7'				SCARP
	10		6.32		6.52				5
ONLY GROUND ELEVATION POINTS ARE NUMBERED	11		5.98		6.32				STADIA MEASUREMENTS
	12		7.32		7.81				10' LOWER BERM CREST
	13		9.14		9.85				10' (D) SWASH
					8.43				14' IN WATER
	TBM		4.35		-k				* DIRECT MEASURE FROM INSTRUMENT
						MEASUREMENTS IN FEET			

Figure 1. Sample of field note format for survey starting at temporary benchmark.

PROFILE 4 FAVORITE BEACH						SMITH X DOE Φ		WIND IS NE 4 PICTURES ROLL 2	
STA.	BS	ELEV.	FS	RANGE	STADIA	PAGES			
TBM	4.35	16.57		84.0	-9'				
1	HI	16.77	4.15	84.0					2x2 STAKE TOP
2	20.92	17.57	3.35	93.0	0				2x2 STAKE GROUND
3		19.57	1.35		9'				INST. STAKE (A)
4		12.89	8.03	113.3	20.3'				DUNE CREST
5		8.26	12.66	134.2	12.86				7
					12.46				
TP 6		6.49	14.43	208.2	15.00				24' (B)
					13.86				
	2.53				2.88				
	HI				2.18				
7	9.02	5.04	3.98	279.4	0				24' HIGH WATER LINE
8		6.00	3.02	303.6	24.2'				(C) BERM CREST
9		4.87	4.15	307.1	24.7'				SCARP
10		2.70	6.32	320.6	6.52				5
					6.12				
11		3.04	5.98	348.6	6.32				10' LOWER BERM CREST
					5.64				
12		1.70	7.32	378.3	7.81				10' (D) SWASH
					6.83				
13		-0.12	9.14	422.6	9.85				14' IN WATER
					3.43				
TBM		16.57	4.35		ck				
						MEASUREMENTS IN FEET			

Figure 2. Sample of reduced field notes.

The form of beach profile surveying proposed herein is not intended to replace standard rod and tape surveys. Rather, it is to be considered as an alternative when a beach profile survey must be performed and only two persons are available or when time constraints dictate that available surveying personnel be used in two-man teams to speed the survey.

**ADDITIONAL INFORMATION:** For further information contact Mr. Andrew W. Garcia of the U.S. Army Engineer Waterways Experiment Station (601)634-3555, Andrew.W.Garcia@erdc.usace.army.mil.

**REFERENCE:** Birkemeier, "Fast, Accurate Two-Person Beach Surveys", Coastal Engineering Technical Aid No. 81-II., U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS, 1981.