

HURRICANE BONNIE HIGH WATER MARKS AND INUNDATION MAPPING

Purpose

Hurricane Bonnie made landfall along the North Carolina coast near the mouth of the Cape Fear River, approximately 20 miles south of Wilmington, NC on 26 August 1998. The storm was slow moving and tracked in a north-northeast direction along the North Carolina coast. The storm surge associated with the storm impacted the entire coastal area of North Carolina. As a result of this storm, The Wilmington District of the Corps of Engineers (COE) was tasked by the Federal Emergency Management Agency (FEMA) to locate high water marks along the coastal area impacted by the storm and produce inundation mapping based on these high water marks. The purpose of this report is to present the high water mark data. The inundation mapping will be produced at a later date pending the availability of funds to complete the mapping.

High Water Marks

High water mark data was collected following the hurricane at various locations along the coastal areas of North Carolina impacted by the surge from Hurricane Bonnie. The U.S. Geological Survey (USGS) and COE collected the high water mark data. The USGS concentrated their effort in the northeastern part of the state including the Pamlico-Albemarle Sound area. The COE collected the data in the southeastern coastal area of the state. Data was collected from Fort Fisher-Kure Beach, NC north through Dare County, NC. In collecting the high water marks an attempt was made to collect both inside and outside marks. A total of 161 high water marks were collected.

Method of Collection High water data was collected based on visual observations by personnel who were familiar with collection of highwater mark data. The high water marks were identified in the field and the location along with other pertinent information was described on data forms. A picture of the high water mark was taken at each location. This same type data had been collected in the southeastern portion of the State following Hurricane Fran in 1996. Attempts were made ,where possible, to collect data at the same locations following Hurricane Bonnie for comparison purposes.

Coordinates The geographic location of the HWM's were described using latitude and longitude. The coordinates of the high water marks were determined in the field using the Geographic Positioning System(GPS). The locations were later verified in the office with the use of topographic maps.

Elevations: COE personnel using conventional surveying methods obtained Elevations of high water marks taken by the COE. A contract surveyor under the direction of the COE obtained the elevations of marks taken by the USGS. These surveyors used either conventional leveling techniques or using dual frequency GPS techniques depending on the conditions. Bench mark elevation data from USGS and various other sources was

obtained and used for vertical control. Table 1 summarizes the pertinent data for each high water mark obtained. Data on the HWM's along with pictures are shown in the following sections of the report. HWM field numbers shown in the table can be used to cross reference the data sheets.

Table 1
Pertinent High Water Mark Data-Coastal North Carolina

HWM ID	HWM Field Number	Inside(I) or Outside(O)	Type Line	Quadrangle Sheet	Latitude	Longitude	Elevation (ft, msl)	Obtained By
KURE BEACH-CAROLINA BEACH AREA								
1	NH-2FB	O	Mud	Kure Beach	33°57'51.1188"	77°55'17.3182"	10.5	U.S. Army Corps of Engineers
2	Hwm2014B	O	Debris	Kure Beach	33°58'10.66001"	77°55'08.05241"	10.7	U.S. Army Corps of Engineers
3	NH-60-KBB	I	Water	Kure Beach	33°58'25.92356"	77°54'52.85720"	13.8	U.S. Army Corps of Engineers
4	NH-122-CBB	I	Water	Carolina Beach	34°02'01.5627"	77°53'33.9779"	8.4	U.S. Army Corps of Engineers
5	NH-120-CBB	I	Debris	Carolina Beach	34°02'08.4643"	77°53'31.5091"	7.4	U.S. Army Corps of Engineers
6	NH-121-CBB	I	Water	Carolina Beach	34°02'08.9644"	77°53'32.0965"	7.7	U.S. Army Corps of Engineers
7	NH-15-FB	I	Water	Carolina Beach	34°02'27.73558"	77°53'24.23328"	8.1	U.S. Army Corps of Engineers
8	NH-123-CBB	I	Water	Carolina Beach	34°03'15.0406"	77°53'10.4131"	7.8	U.S. Army Corps of Engineers
9	NH-17EB	O	Water	Carolina Beach	34°03'24.08027"	77°52'56.68776"	8.4	U.S. Army Corps of Engineers
10	Hwm2026B	I	Water	Carolina Beach	34°03'29.32635"	77°52'56.16151"	9.2	U.S. Army Corps of Engineers
11	NH-63-CBB	I	Mud	Carolina Beach	34°00'58.80906"	77°53'57.52466"	8.0	U.S. Army Corps of Engineers
12	NH-49-NHB	I	Mud	Wrightsville Beach	34°07'54.80"	77°52'10.95"	9.0	U.S. Army Corps of Engineers
SOUTHERN NEW HANOVER COUNTY								
13	NH-70-NHB	O	Debris	Wrightsville Beach	34°09'22.35"	77°51'22.47"	9.2	U.S. Army Corps of Engineers
14	NH-55-NHB	I	Water	Wrightsville Beach	34°09'22.38"	77°51'26.04"	8.8	U.S. Army Corps of Engineers
15	NH-58-WIB	I	Water	Wrightsville Beach	34°11'19.92"	77°52'06.30"	8.4	U.S. Army Corps of Engineers
16	NH-57-WIB	I	Mud	Wrightsville Beach	34°01'28.7605"	77°53'47.7523"	8.0	U.S. Army Corps of Engineers
17	NH-69-NHB	I	Mud	Wrightsville Beach	34°12'48.78"	77°49'54.72"	8.1	U.S. Army Corps of Engineers

Table 1 - continued
Pertinent High Water Mark Data-Coastal North Carolina

HWM ID	HWM Field Number	Inside(I) or Outside(O)	Type Line	Quadrangle Sheet	Latitude	Longitude	Elevation (ft, msl)	Obtained By
WRIGHTSVILLE SOUND-WRIGHTSVILLE BEACH AREA								
18	NH-75-WBB	O	Debris	Wrightsville Beach	34°12'50.40"	77°49'04.56"	7.3	U.S. Army Corps of Engineers
19	NH-74-WBB	O	Debris	Wrightsville Beach	34°12'56.69"	77°48'56.23"	7.3	U.S. Army Corps of Engineers
20	NH-72-WBB	O	Mud	Wrightsville Beach	34°13'00.29"	77°48'53.53"	8.1	U.S. Army Corps of Engineers
21	NH-76-WBB	O	Water	Wrightsville Beach	34°13'05.61"	77°48'47.99"	8.3	U.S. Army Corps of Engineers
22	NH-23-WBB	O	Debris	Wrightsville Beach	34°13'08.96"	77°48'49.95"	8.1	U.S. Army Corps of Engineers
23	NH-130-WBB	O	Mud	Wrightsville Beach	34°12'22.21"	77°48'7.50"	7.3	U.S. Army Corps of Engineers
24	NH-131-WBB	I	Mud	Wrightsville Beach	34°12'30"	77°48'11.0828"	7.4	U.S. Army Corps of Engineers
25	NH-32-GB	O	Water	Wrightsville Beach	34°11'20.5312"	77°48'44.1526"	8.2	U.S. Army Corps of Engineers
26	NH-132-WBB	O	Debris	Wrightsville Beach	34°11'29.683"	77°48'34.9645"	7.4	U.S. Army Corps of Engineers
27	NH-133-WBB	I	Debris	Wrightsville Beach	34°11'26.2293"	77°48'32.5796"	7.2	U.S. Army Corps of Engineers
28	NH-54-WBB	O	Mud	Wrightsville Beach	34°11'31.7886"	77°48'30.2408"	7.2	U.S. Army Corps of Engineers
29	NH-134-WBB	O	Mud	Wrightsville Beach	34°11'41.7545"	77°48'18.2484"	7.5	U.S. Army Corps of Engineers
30	NH-30-EB	O	Mud	Wrightsville Beach	34°13'11.69381"	77°47'19.63218"	7.1	U.S. Army Corps of Engineers
31	NH-19-GB	O	Water	Wrightsville Beach	34°14'06.55221"	77°46'35.44718"	7.4	U.S. Army Corps of Engineers
NORTHERN NEW HANOVER COUNTY								
32	NH-81-MSB	I	Water	Scotts Hill	34°15'30.12"	77°46'47.10"	8.6	U.S. Army Corps of Engineers
33	NH-84-MSB	O	Debris	Scotts Hill	34°16'31.52"	77°46'45.81"	7.4	U.S. Army Corps of Engineers
34	NH-88-PNB	O	Trash	Scotts Hill	34°16'35.52"	77°47'30.24"	6.0	U.S. Army Corps of Engineers
35	NH-87-PNB	O	Trash	Scotts Hill	34°16'36.72"	77°45'42.18"	7.6	U.S. Army Corps of Engineers
36	NH-86-MSB	I	Mud	Scotts Hill	34°16'37.98"	77°48'01.92"	7.9	U.S. Army Corps of Engineers
37	NH-86A-MSB	O	Mud	Scotts Hill	34°16'38.10"	77°47'58.38"	7.4	U.S. Army Corps of Engineers
38	NH-89-PNB	O	Debris	Scotts Hill	34°18'00.72"	77°44'33.48"	8.2	U.S. Army Corps of Engineers

Table 1 - continued
Pertinent High Water Mark Data-Coastal North Carolina

HWM ID	HWM Field Number	Inside(I) or Outside(O)	Type Line	Quadrangle Sheet	Latitude	Longitude	Elevation (ft, msl)	Obtained By
FIGURE EIGHT ISLAND								
39	NH-101-PNB	O	Debris	Scotts Hill	34°16'17.78"	77°44'54.24"	7.6	U.S. Army Corps of Engineers
40	NH-105-PNB	O	Debris	Hampstead	34°16'23.58"	77°44'28.92"	7.2	U.S. Army Corps of Engineers
PENDER COUNTY, NC								
41	PEN-90-SCB	O	Debris	Hampstead	34°18'42.53"	77°43'53.62"	7.2	U.S. Army Corps of Engineers
42	PEN-92WAIB	O	Debris	Hampstead	34°20'26.64"	77°42'21.60"	7.7	U.S. Army Corps of Engineers
43	PEN-93-WAB	O	Debris	Hampstead	34°20'52.20"	77°42'23.40"	7.6	U.S. Army Corps of Engineers
44	PEN-94-HAB	O	Debris	Hampstead	34°21'20.82"	77°41'08.34"	7.0	U.S. Army Corps of Engineers
45	PEN-95-OPB	O	Debris	Hampstead	34°22'17.90"	77°40'04.27"	6.0	U.S. Army Corps of Engineers
46	PEN-97-OPB	O	Debris	Hampstead	34°22'16.98"	77°39'21.36"	7.0	U.S. Army Corps of Engineers
47	PEN-99-SPB	O	Debris	Topsail	34°23'22.56"	77°37'48.96"	5.6	U.S. Army Corps of Engineers

Table 1 - continued
Pertinent High Water Mark Data-Coastal North Carolina

HWM ID	HWM Field Number	Inside(I) or Outside(O)	Type Line	Quadrangle Sheet	Latitude	Longitude	Elevation (ft, msl)	Obtained By
TOPSAIL ISLAND								
TOPSAIL BEACH, NC								
48	A3B	O	Debris	Hampstead	34°21'08.70"	77°39'00.42"	5.8	U.S.Army Corps of Engineers
49	PEN-503TBB	I	Mud	Holly Ridge	34°21'02.8876"	77°38'50.7325"	8.8	U.S. Army Corps of Engineers
50	PEN-504TBB	I	Mud	Holly Ridge	34°21.09.65"	77°38.46.4331"	8.8	U.S. Army Corps of Engineers
51	PEN-505TBB	I	Mud	Holly Ridge	34°23'16.43"	77°21'9.6440"	6.6	U.S. Army Corps of Engineers
52	PE-506-TBB	O	Mud	Hampstead	34°21'12.6201"	77°38'40.6273"	6.9	U.S. Army Corps of Engineers
53	PN-507-TBB	O	Water	Hampstead	34°21'30.24"	77°38'18.1"	7.8	U.S. Army Corps of Engineers
54	PN-508-TBB	I	Water	Hampstead	34°21'23.94"	77°38'23.1000"	7.9	U.S. Army Corps of Engineers
55	PN-509-TBB	O	Mud	Hampstead	34°21'23.94"	77°38'23.10"	8.0	U.S. Army Corps of Engineers
56	PN-510-TBB	I	Water	Hampstead	34°21'20.5565"	77°38'27.3298"	6.8	U.S. Army Corps of Engineers
57	PN-511-TBB	O	Water	Holly Ridge	34°24'5.64"	77°35'6.66"	4.6	U.S. Army Corps of Engineers
SURF CITY, NC								
58	PEN-502-SCB	I	Water	Holly Ridge	34°01'28.7605"	77°53'47.7523"	9.0	U.S. Army Corps of Engineers
59	PEN-501-SCB	O	Debris	Holly Ridge	34°25'46.4259"	77°32'56.5127"	4.4	U.S. Army Corps of Engineers
60	F2B	O	Debris	Holly Ridge	34°26'15.54"	77°31'39.72"	5.1	U.S. Army Corps of Engineers
61	PN-512-SCB	I	Water	Holly Ridge	34°25'57.378"	77°32'12.086"	7.1	U.S. Army Corps of Engineers
62	PN-513-SCB	I	Water	Holly Ridge	34°26'10.92"	77°31'30.72"	11.5	U.S. Army Corps of Engineers

Table 1 - continued
Pertinent High Water Mark Data-Coastal North Carolina

HWM ID	HWM Field Number	Inside(I) or Outside(O)	Type Line	Quadrangle Sheet	Latitude	Longitude	Elevation (ft, msl)	Obtained By
TOPSAIL ISLAND—CONTINUED								
NORTH TOPSAIL BEACH								
63	ON-650-NTB	O	Mud	Spicer Bay	34°30'28.98"	77°23'10.38"	10.1	U.S. Army Corps of Engineers
64	ON-651-NTB	O	Mud	Spicer Bay	34°27'19.0075"	77°29'19.5859"	9.3	U.S. Army Corps of Engineers
65	ON-700-NTB	I	Water	Sneads Ferry	34°30'30.36"	77°23'11.88"	8.5	U.S. Army Corps of Engineers
66	ONS-600NTB	I	Mud	New River Inlet	34°31'43.50"	77°20'45.24"	5.0	U.S. Army Corps of Engineers
67	ON-401-B	I	Mud	Sneads Ferry	34°35'3992"	77°23'58.3856"	4.1	U.S. Army Corps of Engineers
68	ON-300-B	O	Debris	Sneads Ferry	34°35'3992"	77°23'58.3856"	4.4	U.S. Army Corps of Engineers
69	PEN-652NTB	O	Debris	Spicer Bay	34°27'8.34"	77°30'17.64"	3.7	U.S. Army Corps of Engineers
ON SLOW COUNTY, NC								
70	ON-3AB	O	Debris	Holly Ridge	34°28'19.92"	77°30'34.20"	4.1	U.S. Army Corps of Engineers
71	ON-4AB	O	Debris	Spicer Bay	34°29'12.90"	77°28'36.90"	3.4	U.S. Army Corps of Engineers
72	ON-6AB	O	Debris	Sneads Ferry	34°31'20.82"	77°25'27.24"	3.9	U.S. Army Corps of Engineers
73	ON-8AB	O	Debris	New River Inlet	34°32'35.82"	77°21'40.32"	4.2	U.S. Army Corps of Engineers
SWANSBORO, NC								
74	hwm3001	O	Debris	Swansboro	34°41'16.16202"	77°07'01.83573"	7.9	U.S. Army Corps of Engineers
75	CAR-109SWB	O	Mud	Swansboro	34°40'42.54"	77°06'30.72"	5.0	U.S. Army Corps of Engineers
76	ON-12FB	O	Mud	Swansboro	34°41'13.68"	77°07'12.96"	6.3	U.S. Army Corps of Engineers
77	ON-10FB	I	Mud	Swansboro	34°41'12.30"	77°07'05.28"	7.1	U.S. Army Corps of Engineers
78	ON-11FB	O	Debris	Swansboro	34°41'15.66"	77°07'01.80"	7.5	U.S. Army Corps of Engineers

Table 1 - continued
Pertinent High Water Mark Data-Coastal North Carolina

HWM ID	HWM Field Number	Inside(I) or Outside(O)	Type Line	Quadrangle Sheet	Latitude	Longitude	Elevation (ft, msl)	Obtained By
EMERALD ISLE, NC								
79	CAR-102EIB	O	Debris	Swansboro	34°40'00.42"	77°03'46.52"	6.1	U.S. Army Corps of Engineers
80	CAR-112EIB	O	Debris	Swansboro	34°38'48.42"	77°05'50.82"	5.2	U.S. Army Corps of Engineers
81	CAR-110EIB	O	Debris	Salter Path	34°40'28"	76°59'06"	5.2	U.S. Army Corps of Engineers
CARTERET COUNTY, NC								
82	CA-03-CARB	O	Seed	Swansboro, NC	34°40'46.8"	77°03'53.5"	6.2	U.S. Geological Survey
83	CA-01-CARB	O	Debris	Beaufort, NC	34°41'43.6"	76°40'36.72"	5.8	U.S. Geological Survey
84	CA-02-CARB	O	Debris	Beaufort, NC	34°42'11.5"	76°42'38.2"	4.3	U.S. Geological Survey
85	CA-08-CARB	O	Seed	Harkers Island, NC	34°42'30.1"	76°36'59.5"	5.2	U.S. Geological Survey
86	CA-04-CARB	O	Seed	Salter Path, NC	34°42'36.26759"	76°56'28.73153"	6.3	U.S. Geological Survey
87	CA-07-CARB	O	Debris	Beaufort, NC	34°43'14.3"	76°43'53.2"	4.7	U.S. Geological Survey
88	CA-06-CARB	O	Debris	Mansfield, NC	34°43'31.40789"	76°47'02.59012"	4.5	U.S. Geological Survey
89	CA-05-CARB	O	Debris	Salter Path, NC	34°43'33.89751"	76°53'40.86749"	8.2	U.S. Geological Survey
90	CA-09-CARB	O	Debris	Williston, NC	34°47'15.4"	76°36'22.5"	7.6	U.S. Geological Survey
91	CA-10-CARB	O	Debris	Davis, NC	34°48'24.0"	76°27'07.1"	3.4	U.S. Geological Survey
92	CA-11-CARB	O	Debris	Atlantic, NC	34°52'24.3"	76°21'03.8"	4.8	U.S. Geological Survey
PAMLICO COUNTY, NC								
93	D5-PAMB	O	Wash	Arapahoe, NC	35°01'29.2"	76°51'46.6"	3.7	U.S. Geological Survey
94	D1-PAMB	O	Debris	Bayboro, NC	35°08'40.4"	76°45'57.8"	4.8	U.S. Geological Survey
95	D2-PAMB	O	Debris	Vandemere, NC	35°11'04.1"	76°39'39.4"	4.6	U.S. Geological Survey
96	D4-PAMB	O	Wash	Lowland, NC	35°18'02.3"	76°34'19.4"	5.0	U.S. Geological Survey
97	D3-PAMB	O	Seed	Lowland, NC	35°18'17.8"	76°35'23.5"	5.4	U.S. Geological Survey

Table 1 - continued
Pertinent High Water Mark Data-Coastal North Carolina

HWM ID	HWM Field Number	Inside(I) or Outside(O)	Type Line	Quadrangle Sheet	Latitude	Longitude	Elevation (ft, msl)	Obtained By
CRAVEN COUNTY, NC								
98	A-5-CRAB	O	Debris	Havelock, NC	34°55'12.7"	76°54'40.6"	3.5	U.S. Geological Survey
99	CR-05-CRAB	O	Debris	Cherry Point, NC	34°56'08.9"	76°48'34.9"	4.3	U.S. Geological Survey
100	CR-06-CRAB	O	Debris	Cherry Point, NC	34°56'09.1"	76°48'35.3"	4.4	U.S. Geological Survey
101	CR-04-CRAB	O	Debris	Cherry Point, NC	35°56'09.2"	76°48'35.4"	4.5	U.S. Geological Survey
102	A-4-CRAB	O	Debris	Cherry Point, NC	34°56'10.52881"	76°51'36.21080"	3.2	U.S. Geological Survey
103	CR-07-CRAB	O	Debris	Merrimon, NC	34°56'22.7"	76°39'42.8"	3.0	U.S. Geological Survey
104	A-3-CRAB	O	Debris	Havelock, NC	34°58'36.2"	76°56'23.1"	5.3	U.S. Geological Survey
105	CR-02-CRAB	O	Debris	Up. Broad Ck., NC	35°00'03.3"	76°58'33.8"	5.1	U.S. Geological Survey
106	CR-01-CRAB	O	Debris	Up. Broad Ck., NC	35°00'04.1"	76°58'33.3"	5.3	U.S. Geological Survey
107	CR-03-CRAB	O	Debris	Up. Broad Ck., NC	35°00'04.5"	76°58'32.5"	5.3	U.S. Geological Survey
108	A-6-CRAB	O	Debris	Up. Broad Ck, NC	35°02'32.2"	76°59'23.3"	5.4	U.S. Geological Survey
109	A-7-CRAB	O	Debris	New Bern, NC	35°06'10.9"	77°03'21.7"	5.2	U.S. Geological Survey
110	A-1-CRAB	O	Drift	New Bern, NC	35°06'29.1"	77°02'05.2"	5.9	U.S. Geological Survey
111	A-2-CRAB	O	Debris	New Bern, NC	35°06'29.8"	77°02'04.5"	5.3	U.S. Geological Survey
112	D-6-CRAB	O	Seed	Askin, NC	35°08'41.9"	77°02'53.5"	4.7	U.S. Geological Survey
BEAUFORT COUNTY, NC								
113	AU-2-BEAB	O	Debris	Aurora, NC	35°18'15.2"	76°47'00.2"	5.9	U.S. Geological Survey
114	AU-1-BEAB	O	Mud	Aurora, NC	35°18'16.4"	76°46'50.8"	6.0	U.S. Geological Survey

Table 1 - continued
Pertinent High Water Mark Data-Coastal North Carolina

HWM ID	HWM Field Number	Inside(I) or Outside(O)	Type Line	Quadrangle Sheet	Latitude	Longitude	Elevation (ft, msl)	Obtained By
BEAUFORT COUNTY, NC –CONTINUED								
115	B-10-BEAB	O	Debris	Bath, NC	35°28'18.0"	76°48'51.1"	6.5	U.S. Geological Survey
116	B11-BEAB	O	Debris	Bath, NC	35°28'39.1"	76°48'55.9"	6.6	U.S. Geological Survey
117	B-9-BEAB	O	Debris	Pantego, NC	35°31'18.4"	76°38'42.2"	6.0	U.S. Geological Survey
118	B-6-BEAB	O	Seed	Belhaven, NC	35°32'15.6"	76°36'40.4"	5.9	U.S. Geological Survey
119	B-5-BEAB	O	Seed	Belhaven, NC	35°32'20.6"	76°37'14.7"	5.9	U.S. Geological Survey
120	LW-101BEAB	O	Seed	Washington, NC	35°32'25.3"	77°03'44.4"	7.8	U.S. Geological Survey
121	LW-102BEAB	O	Seed	Washington, NC	35°32'38.2"	77°03'35.0"	7.7	U.S. Geological Survey
122	B-7-BEAB	O	Debris	Pantego, NC	35°32'41.7"	76°37'45.4"	5.9	U.S. Geological Survey
123	B-8-BEAB	O	Debris	Pantego, NC	35°32'55.7"	76°37'54.5"	6.1	U.S. Geological Survey
124	B-12-BEAB	O	Seed	Pantego, NC	35°35'17.8"	76°39'48.0"	6.1	U.S. Geological Survey
HYDE COUNTY, NC								
125	B3-HYDB	O	Debris	Swanquarter, NC	35°24'13.7"	76°19'38.6"	4.4	U.S. Geological Survey
126	B4-HYDB	O	Seed	Scranton, NC	35°27'47.0"	76°25'20.7"	5.2	U.S. Geological Survey
127	B13-HYDB	O	Seed	Engelhard East, NC	35°30'31.9"	75°59'55.5"	3.5	U.S. Geological Survey
128	B14-HYD	O	Seed	Engelhard West, NC	35°31'04.4"	76°00'01.4"	3.0	U.S. Geological Survey
TYRRELL COUNTY, NC								
129	18B-TYRB	O	Debris	Columbia West, NC	35°55'11.2"	76°15'14.5"	3.7	U.S. Geological Survey
130	19B-TYRB	O	Seed	Columbia West, NC	35°57'55.0"	76°17'09.0"	4.3	U.S. Geological Survey

Table 1 - continued
Pertinent High Water Mark Data-Coastal North Carolina

HWM ID	HWM Field Number	Inside(I) or Outside(O)	Type Line	Quadrangle Sheet	Latitude	Longitude	Elevation (ft, msl)	Obtained By
BERTIE COUNTY, NC								
131	A-10-BERB	O	Seed	Edenhouse, NC	36°02'35.7"	76°42'30.9"	5.2	U.S. Geological Survey
CHOWAN COUNTY, NC								
132	A-12-CHOB	O	Mud	Edenton, NC	36°00'27.1"	76°30'50.0"	5.2	U.S. Geological Survey
133	A11-CHOB	O	Drift	Edenton, NC	36°00'52.8"	76°34'55.2"	4.4	U.S. Geological Survey
134	A-9-CHOB	O	Mud	Edenhouse, NC	36°03'22.6"	76°37'31.2"	5.1	U.S. Geological Survey
135	A-13-CHOB	O	Debris	Yeopin River, NC	36°03'44.02450"	76°25'24.12776"	5.0	U.S. Geological Survey
136	A-8-CHOB	O	Seed	Edenton, NC	36°03'44.9"	76°37'00.8"	4.5	U.S. Geological Survey
PERQUIMANS COUNTY, NC								
137	A14-PERB	O	Mud	Hertford, NC	36°10'43.9"	76°25'06.8"	5.3	U.S. Geological Survey
PASQUOTANK COUNTY, NC								
138	A20-PASB	O	Debris	Weeksville, NC	36°08'11.52835"	76°12'12.85849"	3.1	U.S. Geological Survey
139	A19-PASB	O	Wash	Wade Point, NC	36°10'01.5"	76°04'17.2"	2.5	U.S. Geological Survey
140	A-21-PASB	O	Seed	Nixonton, NC	36°12'30.1"	76°16'33.6"	5.6	U.S. Geological Survey
141	A-18-PASB	O	Debris	Elizabeth City, NC	36°15'07.6"	76°08'15.5"	4.9	U.S. Geological Survey
142	A-17-PASB	O	Debris	Elizabeth City, NC	36°17'21.8"	76°12'18.5"	3.5	U.S. Geological Survey
143	A-15-PASB	O	Wash	Elizabeth City, NC	36°18'00.8"	76°12'44.3"	3.5	U.S. Geological Survey
DARE COUNTY, NC								
144	DAR-16B	O	Debris	Hatteras, NC	35°12'56.3"	75°40'34.1"	5.5	U.S. Geological Survey
145	DAR-15B	O	Seed	Buxton, NC	35°16'37.9"	75°31'03.9"	5.2	U.S. Geological Survey
146	DAR-13B	O	Mud	Buxton, NC	35°21'08.6"	75°30'34.3"	5.0	U.S. Geological Survey

Table 1 - continued
Pertinent High Water Mark Data-Coastal North Carolina

HWM ID	HWM Field Number	Inside(I) or Outside(O)	Type Line	Quadrangle Sheet	Latitude	Longitude	Elevation (ft, msl)	Obtained By
DARE COUNTY, NC—CONTINUED								
147	DAR-12B	I	Seed	Buxton, NC	35°21'50.4"	75°29'56.9"	6.0	U.S. Geological Survey
148	DAR-9B	O	Debris	Little Kinnakeet, NC	35°22'41.8"	75°29'45.2"	6.1	U.S. Geological Survey
149	DAR-6B	O	Seed	Rodanthe, NC	35°35'29.9"	75°28'12.9"	6.0	U.S. Geological Survey
150	DAR-5B	O	Debris	Rodanthe, NC	35°35'42.1"	75°28'04.9"	5.7	U.S. Geological Survey
151	DAR-4B	O	Water	Rodanthe, NC	35°36'26.1"	75°27'54.6"	6.2	U.S. Geological Survey
152	DAR-2B	O	Debris	Pea Island, NC	35°44'24.9"	75°30'11.4"	5.5	U.S. Geological Survey
153	DAR-18B	O	Debris	Oregon Inlet, NC	35°47'56.2"	75°32'50.1"	4.3	U.S. Geological Survey
154	DAR-21B	O	Debris	Manteo, NC	35°52'43.2"	75°39'43.4"	3.9	U.S. Geological Survey
155	DAR-31B	O	Seed	Manns Harbor, NC	35°53'02.0"	75°45'51.5"	4.1	U.S. Geological Survey
156	DAR-20B	I	Seed	Roanoke Isl. NE, NC	35°53'52.9"	75°37'02.7"	5.4	U.S. Geological Survey
157	DAR-19B	I	Seed	Roanoke Isl. NE, NC	35°54'06.1"	75°36'23.7	5.4	U.S. Geological Survey
158	DAR-22B	I	Seed	Manteo, NC	35°54'32.3"	75°40'09.6"	5.5	U.S. Geological Survey
159	DAR-28B	O	Seed	Roanoke Isl. NE, NC	35°54'44.6"	75°36'07.3"	6.2	U.S. Geological Survey
160	DAR-27B	O	Seed	Manteo, NC	35°57'06.6"	75°37'56.0"	5.8	U.S. Geological Survey
161	DAR-24B	O	Seed	Jarvisburg, NC	36°13'31.3"	75°46'19.6"	3.6	U.S. Geological Survey

Comparison of Hurricane Bonnie and Hurricane Fran Surge.

Hurricane Fran in 1996 and Hurricane Bonnie in 1998 both made landfall in the same vicinity. Hurricane Fran made landfall near Carolina Beach, NC and tracked generally up the Cape Fear River and eventually Northwest into the interior part of North Carolina. Hurricane Bonnie made landfall approximately 10 miles south of Carolina Beach near the mouth of the Cape Fear River and again tracked generally up the Cape Fear River impacting much of the same area in Southeastern North Carolina. Hurricane Bonnie turned in a more Northeastern direction and followed the coast of North Carolina impacting the entire coastal area of North Carolina. In order to build a data base and serve as a comparison, attempts were made to obtain high water marks for Hurricane Bonnie at some of the same locations as those for Hurricane Fran. Table 2 shows the comparison between Hurricane Bonnie and Hurricane Fran. Data sheets showing the comparison are included at the end of the report.

Table 2
Comparison of High Water Mark Data-Coastal North Carolina
Hurricane Bonnie and Hurricane Fran

HWM ID	HWM Field Number	Inside(I) or Outside(O)	Type Line	Quadrangle Sheet	Latitude	Longitude	Elevation Hurricane Fran (ft., msl)	Elevation Hurricane Bonnie (ft., msl)
KURE BEACH-CAROLINA BEACH AREA								
1	NH-2FB	O	Mud	Kure Beach	33°57'51.1188"	77°55'17.3182"	8.4	10.5
2	Hwm2014B	O	Debris	Kure Beach	33°58'10.66001"	77°55'08.05241"	12.5	10.7
3	NH-60-KBB	I	Water	Kure Beach	33°58'25.92356"	77°54'52.85720"	14.1	13.8
7	NH-15-FB	I	Water	Carolina Beach	34°02'27.73558"	77°53'24.23328"	10.5	8.1
9	NH-17EB	O	Water	Carolina Beach	34°03'24.08027"	77°52'56.68776"	10.7	8.4
10	Hwm2026B	I	Water	Carolina Beach	34°03'29.32635"	77°52'56.16151"	10.0	9.2
11	NH-63-CBB	I	Mud	Carolina Beach	34°00'58.80906"	77°53'57.52466"	10.1	8.0
SOUTHERN NEW HANOVER COUNTY								
12	NH-49-NHB	I	Mud	Wrightsville Beach	34°07'54.80"	77°52'10.95"	11.1	9.0
13	NH-70-NHB	O	Debris	Wrightsville Beach	34°09'22.35"	77°51'22.47"	11.1	9.2
14	NH-55-NHB	I	Water	Wrightsville Beach	34°09'22.38"	77°51'26.04"	11.2	8.8
15	NH-58-WIB	I	Water	Wrightsville Beach	34°11'19.92"	77°52'06.30"	11.1	8.4
16	NH-57-WIB	I	Mud	Wrightsville Beach	34°01'28.7605"	77°53'47.7523"	10.9	8.0
17	NH-69-NHB	I	Mud	Wrightsville Beach	34°12'48.78"	77°49'54.72"	10.9	8.1
WRIGHTSVILLE SOUND-WRIGHTSVILLE BEACH AREA								
18	NH-75-WBB	O	Debris	Wrightsville Beach	34°12'50.40"	77°49'04.56"	10.6	7.3
19	NH-74-WBB	O	Debris	Wrightsville Beach	34°12'56.69"	77°48'56.23"	10.7	7.3
20	NH-72-WBB	O	Mud	Wrightsville Beach	34°13'00.29"	77°48'53.53"	10.5	8.1
21	NH-76-WBB	O	Water	Wrightsville Beach	34°13'05.61"	77°48'47.99"	10.8	8.3

Table 2 - continued
Comparison of High Water Mark Data-Coastal North Carolina
Hurricane Bonnie and Hurricane Fran

HWM ID	HWM Field Number	Inside(I) or Outside(O)	Type Line	Quadrangle Sheet	Latitude	Longitude	Elevation Hurricane Fran (ft., msl)	Elevation Hurricane Bonnie (ft., msl)
WRIGHTSVILLE SOUND-WRIGHTSVILLE BEACH AREA—CONTINUED								
22	NH-23-WBB	O	Debris	Wrightsville Beach	34°13'08.96"	77°48'49.95"	10.1	8.1
25	NH-32-GB	O	Water	Wrightsville Beach	34°11'20.5312"	77°48'44.1526"	10.3	8.2
28	NH-54-WBB	O	Mud	Wrightsville Beach	34°11'31.7886"	77°48'30.2408"	10.2	7.2
30	NH-30-EB	O	Mud	Wrightsville Beach	34°13'11.69381"	77°47'19.63218"	10.3	7.1
31	NH-19-GB	O	Water	Wrightsville Beach	34°14'06.55221"	77°46'35.44718"	10.4	7.4
NORTHERN NEW HANOVER COUNTY								
32	NH-81-MSB	I	Water	Scotts Hill	34°15'30.12"	77°46'47.10"	11.3	8.6
33	NH-84-MSB	O	Debris	Scotts Hill	34°16'31.52"	77°46'45.81"	11.5	7.4
34	NH-88-PNB	O	Trash	Scotts Hill	34°16'35.52"	77°47'30.24"	11.3	6.0
35	NH-87-PNB	O	Trash	Scotts Hill	34°16'36.72"	77°45'42.18"	11.3	7.6
36	NH-86-MSB	I	Mud	Scotts Hill	34°16'37.98"	77°48'01.92"	12.1	7.9
37	NH-86A-MSB	O	Mud	Scotts Hill	34°16'38.10"	77°47'58.38"	11.3	7.4
38	NH-89-PNB	O	Debris	Scotts Hill	34°18'00.72"	77°44'33.48"	12.1	8.2
FIGURE EIGHT ISLAND								
39	NH-101-PNB	O	Debris	Scotts Hill	34°16'17.78"	77°44'54.24"	10.9	7.6
40	NH-105-PNB	O	Debris	Hampstead	34°16'23.58"	77°44'28.92"	10.4	7.2

Comparison of High Water Mark Data-Coastal North Carolina
Hurricane Bonnie and Hurricane Fran

HWM ID	HWM Field Number	Inside(I) or Outside(O)	Type Line	Quadrangle Sheet	Latitude	Longitude	Elevation Hurricane Fran (ft., msl)	Elevation Hurricane Bonnie (ft., msl)
PENDER COUNTY, NC								
41	PEN-90-SCB	O	Debris	Hampstead	34°18'42.53"	77°43'53.62"	11.3	7.2
42	PEN-92WAIB	O	Debris	Hampstead	34°20'26.64"	77°42'21.60"	11.4	7.7
43	PEN-93-WAB	O	Debris	Hampstead	34°20'52.20"	77°42'23.40"	11.6	7.6
44	PEN-94-HAB	O	Debris	Hampstead	34°21'20.82"	77°41'08.34"	11.7	7.0
45	PEN-95-OPB	O	Debris	Hampstead	34°22'17.90"	77°40'04.27"	11.2	6.0
46	PEN-97-OPB	O	Debris	Hampstead	34°22'16.98"	77°39'21.36"	11.1	7.0
47	PEN-99-SPB	O	Debris	Topsail	34°23'22.56"	77°37'48.96"	9.1	5.6
TOPSAIL ISLAND								
TOPSAIL BEACH, NC								
48	A3B	O	Debris	Hampstead	34°21'08.70"	77°39'00.42"	9.5	5.8
SURF CITY, NC								
60	F2B	O	Debris	Holly Ridge	34°26'15.54"	77°31'39.72"	7.2	5.1
ONSLOW COUNTY, NC								
70	ON-3AB	O	Debris	Holly Ridge	34°28'19.92"	77°30'34.20"	6.9	4.1
71	ON-4AB	O	Debris	Spicer Bay	34°29'12.90"	77°28'36.90"	8.1	3.4

Table 2 - Continued
Comparison of High Water Mark Data-Coastal North Carolina
Hurricane Bonnie and Hurricane Fran

HWM ID	HWM Field Number	Inside(I) or Outside(O)	Type Line	Quadrangle Sheet	Latitude	Longitude	Elevation Hurricane Fran (ft., msl)	Elevation Hurricane Bonnie (ft.,msl)
ONSLOW COUNTY, NC --CONTINUED								
72	ON-6AB	O	Debris	Sneads Ferry	34°31'20.82"	77°25'27.24"	8.1	3.9
73	ON-8AB	O	Debris	New River Inlet	34°32'35.82"	77°21'40.32"	7.3	4.2
SWANSBORO, NC								
74	hwm3001	O	Debris	Swansboro	34°41'16.16202"	77°07'01.83573"	8.1	7.9
75	CAR-109SWB	O	Mud	Swansboro	34°40'42.54"	77°06'30.72"	7.2	5.0
76	ON-12FB	O	Mud	Swansboro	34°41'13.68"	77°07'12.96"	8.4	6.3
77	ON-10FB	I	Mud	Swansboro	34°41'12.30"	77°07'05.28"	7.9	7.1
78	ON-11FB	O	Debris	Swansboro	34°41'15.66"	77°07'01.80"	8.6	7.5
EMERALD ISLE, NC								
79	CAR-102EIB	O	Debris	Swansboro	34°40'00.42"	77°03'46.52"	7.0	6.1

Storm Surge The storm surge was also recorded at one location along the AIWW by Mr. Spencer Rogers, NC Sea Grant at his residence which is located on the western side of the AIWW between Carolina Beach and Wrightsville Beach, NC. These observations give a very accurate record of the storm surge along the New Hanover County coast line. Table 3 gives the time and elevations associated with the measurements. The plot of the surge is shown on figure 1.

Table 3
Storm Surge Data - Southern New Hanover County

Time in Hours	Elevation (feet, msl)
11:00 AM	5.00
11:20 AM	6.70
11:40 AM	6.70
12:01 PM	7.52
12:36 PM	9.12
12:52 PM	9.12
12:58 PM	8.95
1:05 PM	8.95
2:18 PM	9.12
4:15 PM	4.97

Maximum elevation = 9.1 feet, msl

The maximum elevation recorded at this location during Hurricane Fran was 11.2 ft, msl.

HURRICANE BONNIE SURGE 26 AUGUST 1998

