Chapter 5
Transportation/Clearance Time Data

In FEMA/Corps comprehensive hurricane evacuation studies, the primary objective of the transportation analysis is to determine the clearance times needed to conduct a safe and timely evacuation for a range of hurricane threats. Information from the vulnerability, shelter, and behavioral analyses are directly input as well as various sources of permanent and seasonal population data. For the North Carolina, South Carolina, and Georgia studies, clearance times were developed by county for two or three storm intensity groups (eg. Category 1-2, Category 3-5), several seasonal occupancy assumptions, and three to four rates of mobilization on the part of the evacuating population. The number of scenarios for a particular county was obviously dependent upon the flooding and population characteristics of that locality.

Transportation and clearance time issues related to Hugo and discussed by the study team with local and state officials included the following:

Was the evacuation roadway network accurate - did evacuees use projected routes?

Were any traffic control actions taken to speed up flow?

When was the evacuation essentially complete - how long did the evacuation take?

Were any major problems encountered in the evacuation?

Tables 4, 5, and 6 summarize the responses to each of these issues gathered from discussions with local emergency and law enforcement officials in each area. In Georgia, clearance times calculated for FEMA/Corps studies compared well with the actual times experienced in Hurricane Hugo. For those counties carrying out major evacuations, study produced times were within an hour of actual times. In Liberty and Bryan Counties, it was difficult to determine actual clearance times due to lack of information available - potential flooded areas of these two counties

Table 4
Hurricane Hugo
Transportation/Clearance Time Data - Georgia

Location	Evacuation Roadway Network Accurate?	Special Traffic Control Actions	Clearance Time Experienced in Hugo	Study Calculated Clearance Time*	Problems Encountered
GEORGIA					
Camden Co.	Yes	None	7 hours	6 hours	None
Glynn Co. - Brunswick	Yes	Stopped incoming traffic Jekyll Island	8 hours	8¾ hours	None
McIntosh Co.	-	-	-	6 hours	-
Liberty Co.	Yes	None	Not discernable	6¼ hours	None, traffic like a normal day
Bryan Co.	Yes	None	Not discernable	6½ hours	None, traffic like normal all day
Chatham Co. - Savannah	Yes, Bay Street blocked by a fire	Traffic control points manned in some locations	10 hours	9 hours	Not all critical intersections were manned by police; congestion on I-16

* In Georgia, coastal counties took action for a Category 2 Hurricane - therefore, data for a category 2 scenario (low tourist occupancy) from the Technical Data Report is presented here for comparison to Hugo data.

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Table 5
Hurricane Hugo
Transportation/Clearance Time Data - South Carolina

Location	Evacuation Roadway Network Accurate?	Special Traffic Control Actions	Clearance Time Experienced in Hugo	Study Calculated Clearance Time*	Problems Encountered
SOUTH CAROLINA					
Jasper Co.	Evacuees came directly into Ridgeland on U.S. 278 due to new access ramps with I-95	law enforcement stationed at key locations	5 hours	8 hours	congestion at Ridgeland
Beaufort Co. - Hilton Head	Yes	law enforcement stationed at traffic control points, highway patrol back-up	9 hours	9¼ hours	trouble getting generators into county
Colleton Co.	Yes	law enforcement on Hwy. 174 of Edisto area	2 hours for Edisto Beach, not discernable for remainder of county, campers evacuated Wed.	6 hours for locals/11¾ for S.R. 61 traffic out of Charleston	congestion on I-95
Charleston Co.	Yes, some improvements to Mark Clark Expressway since original study	locked down bridges as appropriate with Coast Guard and highway dept.; some critical roadway points manned; considered reverse laning of I-26 but did not do it	15 hours (2 AM - 5 PM Thursday 21st)	16¼ hours	I-26 congestion; I-26/I-95 interchange; many traffic control points not manned alt. routes to I-26 not used enough
Georgetown Co.	Yes	Critical intersections manned; state highway patrol back-up	6½ hours	6¼ hours	None
Horry Co. - Myrtle	Yes	officers manned checkpoint	9 hours	12¼ hours	motels evacuated late, congestion at Florence

* In South Carolina, the level of evacuation carried out in Hugo was directly related to a Category 3 low tourist occupancy situation as presented in the Technical Data Report. The exception to this was Jasper and Horry Counties whose evacuation level resembled the Category 2 low tourist occupancy scenario.

Table 6
Hurricane Hugo
Transportation/Clearance Time Data - North Carolina

Location	Evacuation Roadway Network Accurate?	Special Traffic Control Actions	Clearance Time Experienced in Hugo	Study Calculated Clearance Time*	Problems Encountered
NORTH CAROLINA					
Brunswick Co.	Yes	fire and police manned traffic control points; preferences given to outgoing traffic on Sunset bridge	5 hours	6½ hours	None
New Hanover Co. Wilmington	Yes	none	5 hours	6¼ hours	None
Pender Co.	-	-	-	6 hours	-
Onslow Co.	Yes	state highway patrol helped at several key intersections	4 hours	9 hours	None
Carteret Co.	Yes	local police and highway patrol manned traffic control points	5 hours	8½ hours	None
Dare Co.	Yes	local law enforcment manned highways	10 hours	11½ hours	None

* In North Carolina, the level of evacuation carried out in Hugo was a Scenario A type situation as presented in the Technical Data Report. This corresponds to a Category 1-3 Hurricane, low tourist occupancy.

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have relatively low population levels and therefore can evacuate in short periods of time depending on the mobilization rate of evacuees. Limited special traffic control measures were taken in coastal Georgia. No major traffic problems were reported except along I-16 where congestion was significant at I-95 and as far west as Macon, Georgia. No information was provided by McIntosh County for evacuation related to Hugo.

In South Carolina study produced clearance times compared very well with actual times for those areas that had the most direct effects from Hugo. Based on the clearance times incorporated from the study into HURREVAC (see Chapter 6) Charleston County officials had to decide to start their evacuation well before a hurricane warning was issued for the area. In retrospect, this difficult decision proved to be extremely wise on the part of local officials as evidenced by the successful evacuation of thousands of residents before the onset of hazardous conditions from Hugo. Clearance times for Beaufort County and Georgetown County were very close to actual times as well. Clearance times for Jasper County and Horry County were significantly lower than study produced times. Review of available information indicates that the evacuation in Horry County was focused on beachfront, low lying areas, and mobile homes. Hotels and motels appeared to be reluctant to advise residents to leave. Thus somewhat of a partial evacuation appears to have taken place in Horry County relative to scenarios in the Technical Data Report. Jasper County reported a clearance time of between 4 and 5 hours for local residents. The 8 hour study produced time includes a significant amount of Beaufort County "pass through traffic". It is difficult to make a meaningful comparison of times in Colleton County as the Technical Data Report reflects times for roads traveled by Charleston County evacuees (e.g. Highway 61). In addition, the only area where a good estimate of actual clearance time can be determined is Edisto Beach which evacuated in approximately 2 hours.

Special traffic control measures in South Carolina coastal counties during Hugo, primarily involved law enforcement officers staffing critical intersection and roadway segments. State highway patrol assisted coastal counties with this task while also dealing with major congestion problems along I-26 near I-95. Bridges in Charleston County (such as the Ben Sawyer) were locked down with cooperation from the Coast Guard and state highway department. As traffic came to a crawl (late Thursday September 21 AM) on I-26 out of Charleston, officials considered

reverse laning the eastbound lanes from Charleston to Columbia. However, by early afternoon traffic began to flow more smoothly and a determination was made not to go through with the reverse laning.

In North Carolina, clearance times compared favorably with study produced clearance times in Brunswick, New Hanover, and Dare Counties. No information was reported for Pender County. Times in Onslow and Carteret were significantly below those in the Technical Data Report. Onslow County carried out a very limited evacuation compared to scenarios analyzed in the North Carolina study. Carteret County reported a five hour clearance time for local traffic but did not know how long it took for traffic to clear Craven County. Clearance times reported in the Technical Data Report for Carteret County reflect getting traffic through Craven County's critical links. Traffic control primarily involved police officers manning key intersections and no major traffic problems were encountered.

RECOMMENDATIONS

Based on Hurricane Hugo, it is recommended that the following items be considered for future transportation analysis studies:

1) Enlarge the study area boundaries to include potential traffic problem spots in inland counties. For example, the I-95/I-26 interchange in South Carolina was outside the original study area.

2) Stress the importance of all critical intersections being staffed by law enforcement officials to keep traffic moving.

3) Remind public officials that major congestion will occur on evacuation routes during the middle of the evacuation and that this will dissipate as traffic loadings decrease during the last third of an evacuation.

4) Run a scenario where only a small percent of evacuees go to local public shelter versus leaving the county and going inland.

5) Encourage the use of secondary roads by evacuees through public information and/or signage.

Chapter 6
Evacuation Decision Making

Some of the most important products developed as a part of the FEMA/ Corps of Engineers hurricane studies and delivered to local state officials have been evacuation decision making tools. These tools have been decision arc maps and tables as well as computer software such as HURREVAC. Products such as these graphically tie together real-time storm characteristics with clearance time data. Their purpose is to give directors a means of retrieving Technical Data Report information without having to dig through a report during an emergency. Evacuation decision tools suggest when an evacuation should begin relative to a specific hurricane, its associated wind field, forward speed, probabilities, forecast track, and intensity.

In February of 1989, FEMA provided state and local officials in South Carolina a computerized informational model which utilizes technical data contained in the study along with information contained in the marine and public advisories from the National Hurricane Center. The model, called HURREVAC, is a tool to assist local officials in making hurricane evacuation decisions. HURREVAC has since been adapted to Georgia and its data base and was delivered to county officials just days before Hugo threatened the area. North Carolina and Georgia both were provided with a set of decision arcs and tables during FEMA/Corps study efforts. These products were the primary evacuation decision making tools used for Hugo in those two states.

Discussions initiated by the FEMA/Corps study team with local and state officials regarding the evacuation decision process focused on the following questions:

When was the EOC fully activated and what prompted this decision?

In deciding when to evacuate and who should evacuate what study products/ decision aids were used?

When was the evacuation order or request made?

Did technical data/decision tools work well and did mapping provide a good depiction of the hazard areas?

Tables 7, 8, and 9 provide data for each state and county related to the above issues. In Georgia, counties generally activated their EOCs based on weather service information and decision arc considerations. In addition to the decision arcs, surge inundation mapping developed in the FEMA/Corps studies was used extensively. Since HURREVAC had just been delivered to the local counties a couple of days before Hugo it was used sparingly in most counties. However, Liberty and Glynn Counties were able to get it up and running and relied upon it during Hugo. Corps of Engineers staff in Savannah assisted Chatham County during the Hugo threat with HURREVAC runs produced on computers at the Corps' offices. Local officials in coastal Georgia counties were pleased with the decision arc system. Glynn County officials feel the ability to get timely marine advisories would have helped their decision making. Chatham county officials were impressed with the accuracy of timing data but would have preferred larger scale surge maps for some of their decision making.

In South Carolina, local officials fully activated EOCs in response to close communications with Dick Shenot of the National Weather Service. Coordination among counties in each "emergency preparedness conglomerate" also prompted activation such as the discussions in Jasper and Colleton Counties with William Winn of Beaufort County. Decision tools used for Hugo included Hazards Management Groups' GDS, HURREVAC, zone maps, surge inundation mapping, and a SLOSH program installed on local personal computers several years ago. GDS was used up until HURREVAC could show the storm on the computer screen. At that point, officials indicated that HURREVAC was used primarily with marine advisories being directly fed into the program every 3 to 6 hours. Local officials were pleased with the study products and decision aids provided. The products provided credibility to local emergency managers in the eyes of local county commissioners and other decision makers.

Local counties in North Carolina fully activated their EOCs based on the prompting of several different factors. These included weather service information, decision arc considerations, state area office advice, and Skip Waters, a local weatherman in New Bern. Study tools used were the decision arcs and the surge

Table 7
Hurricane Hugo Assessment
Evacuation Decision Process Data - Georgia

Location	Time EOC was fully activated	What prompted the decision to activate	What study products/ decision aids were used in deciding when and who should evacuate	Time of Evacuation Order or Request	How well did study Products work?
GEORGIA					
Camden Co.	1200/Wed. 20th	weather information	surge inundation mapping; decision arcs	0700/Thurs. 21st; some voluntary evac. Wed. PM	good
Glynn Co. - Brunswick	1200/Wed. 20th	weather service information	decision arcs, surge inundation mapping, HURREVAC	at hurricane watch posting on Wed.	decision arcs-worked well; need to be able to retrieve marine advisory better to use HURREVAC effectively
McIntosh Co.	-	-	-	-	-
Liberty Co.	at hurricane watch Wed. 20th	weather service information	HURREVAC primarily; decision arcs on wall to show people	0700/Thurs. 21st	very well
Bryan Co.	0600/Wed. 20th	weather service information	surge inundation mapping; decision arcs	0800/Thurs. 21st	OK
Chatham Co.	0430/Thurs. 21st	weather service information	decision arcs; SLOSH program; surge inundation mapping; HURREVAC runs from Corps staff	0600/Thurs. 21st	well, concerned initially that decision arcs prompted evac. too early but it was "right on target"; would like larger scale surge/zone maps

Table 8
Hurricane Hugo Assessment
Evacuation Decision Process Data - South Carolina

Location	Time EOC was fully activated	What prompted the decision to activate	What study products/ decision aids were used in deciding when and who should evacuate	Time of Evacuation Order or Request	How well did study Products work?
SOUTH CAROLINA					
Jasper Co.	0900/Thurs. 21st	storm information; call from William Winn of Beaufort Co.	surge inundation and zone maps	0930/Thurs. 21st	OK
Beaufort Co. - Hilton Head	2400/Wed. 20th	weather service information	HURREVAC, zone maps	0600/Thurs. 21st	very well, timing data on target
Colleton Co.	0500/Thurs. 21st	weather service; information; discussions with William Winn of Beaufort Co.	GDS used until HURREVAC could pick up the storm; HURREVAC	0600/Thurs. 21	good; HURREVAC needs to be sensitive to Weatherwire every 3 hour reports
Charleston Co.	2400/Wed. 20th	weather service information; Dennis Clark's timing wheel	GDS, HURREVAC, zone maps, SLOSH program, marine advisory; weather channel	2300/Wed. 20th went on 11 PM news and asked for voluntary evac. to begin; 0600/Thurs. 21st manatory	generally worked well; nervous using the storm information but it worked out to be on target; products provided credibility
Georgetown Co.	Wed. 20th PM	weather service information	HURREVAC, zone maps	0900/Thurs. 21st	worked well; would like larger maps and a high tourist occ. situation re-addressed
Horry Co.	Wed. 20th	weather service information	zone maps	1200/Thurs. 21st	good

Table 9
Hurricane Hugo Assessment
Evacuation Decision Process Data - North Carolina

Location	Time EOC was fully activated	What prompted the decision to activate	What study products/ decision aids were used in deciding when and who should evacuate	Time of Evacuation Order or Request	How well did study Products work?
NORTH CAROLINA					
Brunswick Co.	1000/Thurs. 21st	weather service information; decision arcs	decision arcs; surge inundation maps	1400/Thurs. 21st	excellent; decision arcs on target
New Hanover Co.	1500/Thurs. 21st	weather service information timing data	decision arcs; surge inundation maps	1300/Thurs. 21st	good
Pender Co.	-	-	-	-	-
Onslow Co.	Thurs. 21st afternoon	state area office	surge inundation maps	1600/Thurs. 21st	OK; did'nt have time to use decision arcs
Carteret Co.	Thurs. 21st morning	weather service information; Skip the weatherman	decision arcs, surge inundation maps, Skip's forecasted storm track	1500/Thurs. 21st	OK; storm didn't really affect area
Dare Co.	Thurs. 21st	National Weather Service advisories; threat of northern turn by Hugo	decision arcs; surge	1400/Thurs. 21st	good

inundation mapping. Local officials were very pleased with the decision arc system.

RECOMMENDATIONS

Products being provided by FEMA/Corps hurricane studies regarding evacuation decision making seem to be working well. Officials like the ability to show decision makers a "computerized" data base that ties together Technical Data Report information. The only improvement which was previously discussed in Chapter 2 is surge mapping and zone maps at a larger scale. Excellent working relationships between local emergency directors and NWS staff is important to good decision-making. Local officials should be encouraged to continue to develop these relationships with NWS staff.

Chapter 7
Public Information

Although not a major part of previous FEMA/Corps of Engineers hurricane evacuation study efforts, public information is becoming recognized as an important final element that must be addressed. Study products and data must ultimately be in a format that the media and general public can understand so that correct evacuation decisions and preparations can be made at the household level. Hugo provided a glimpse of what current means of getting hurricane evacuation information into the hands of the general public is available. It also provided local and state officials with an opportunity to assess additional needs in regards to public information.

Current methods used in Georgia, South Carolina, and North Carolina for informing the public in Hugo included the following:

1) the most important means was through radio and television - some communities used cable TV overrides to alert the public of evacuation advisories.

2) press briefings with national and local media to insure that they (radio, TV, newspapers) disseminate consistent information to the public - media was given packets of hurricane materials early in the season by some emergency officials.

3) law enforcement officials drove through neighborhoods with sirens and p.a. systems to encourage people to evacuate - this technique was used in most beach and barrier island communities - some officials went door to door.

4) some communities were able to provide evacuation information to the public through an insert in the local phone book.

5) information was provided several days before the arrival of Hugo through newspaper articles.

6) hurricane evacuation brochures published by the state (e.g. North Carolina) were picked up by residents.

7) meetings had been held with civic groups early in the season at which local emergency directors made presentations on hurricane preparedness including wind and flooding potential.

8) in some inland rural areas, mobile home residents were phoned to make sure they understood the threat (e.g. Colleton County, S.C.).

9) prepared announcements given to media in advance - these were relayed to public upon prompting by emergency officials (e.g. Georgetown County, S.C., Carteret County, N.C.).

10) late in the Hugo situation, WPDQ in Jacksonville, Florida broadcast public information to coastal areas in Georgia, South Carolina, and North Carolina as local radio stations lost broadcasting ability during Hugo (loss of power, towers).

11) public was alerted that power would be turned off in their area even if they stayed - this encouraged people to evacuate (e.g. Tybee Island, Ga.).

12) recommendations from Governor's office for people to evacuate.

13) civil defense sirens (e.g. Savannah, Georgia).

RECOMMENDATIONS

In discussions with media representatives in the Savannah, Georgia and Charleston, South Carolina markets and with all of the local and state emergency officials, the following ideas and resources were identified as needs in the area of public information:

- more camera ready/computerized mapping of surge areas, routes, and shelter locations for media

- computerized "billboard" only available to media via modem - emergency officials would provide notices and information through this

- need to address EBS operations - most stations do not want to participate now due to financial concerns

- need more phone lines/staff for public to call into EOC's for information

- prepare newspaper supplement in advance that could be inserted a day before projected landfall

- beef-up phone book materials and inserts that can be used in a real time event

- produce canned videos for TV's to broadcast

- print more state brochures

- provide more local information (surge heights imposed on pictures of local landmarks)

- install uniform evacuation route signs

- put up signs giving inland shelter/EBS station information

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APPENDIX A

Meeting Attendees/Persons Providing Input in Affected Areas

Ken Old	Corps of Engineers	(919)251-4724
Bill Massey	FEMA	(404)853-4430
Don Lewis	PBS&J	(904)224-7275
Keith Graham	Corps of Engineers	(205)694-3882
W.R. Cavanaugh	Glynn Co. Fire Department	(912)267-5717
Jimmy C. Carter	Brunswick Police	(912)267-5559
Carl Alexander	Glynn County Police	(912)267-5700
Richard Crowdis	City of Brunswick	(912)267-5500
Robert T. Horton	City of Brunswick	(912)267-5569
Deborah B. Chapman	Glynn County Community Dev.	(912)267-5740
Rebecca Tindall	Glynn Co. CD/EMA	(912)267-5780
Robert D. Mumford	Camden Co. CD	(912)882-4272
Joan Scarborough	American Red Cross	(912)265-1695
Mary Brown	Glynn-Brunswick Memorial Hospital	(912)264-7130
Richard Caton	Jekyll Island Fire Department	(912)635-2930
James H. Nazzrie	Glynn County Police	(912)267-5700
Billy E. Griner	Glynn Co. Health Department	(912)264-3961
Jack H. Hutto	GEMA	(912)632-8986
Ed Stells	Glynn Co.-P.I.O.	(912)267-5741
Keith A. Flanagan	Glynn County Public Works	(912)267-5760
Robert Heape	Savannah District U.S.C.O.E.	(912)944-5339
Paul Tasciott	Glynn Co. Sheriff Department	(912)267-5660
Karen Moore	Glynn Co. Commission	(912)638-1260
Lee J. Stewart	Brunswick Fire Department	(912)267-5550
Tony Kreimberg	Glynn County DFCS	(912)265-4267
Erin Cravey	WGIG Radio	(912)265-3870
Jon Roney	Whelen Engineering (Outdoor Sirens)	(615)890-5916
Charles Stewart	Glynn Co. Administration	(912)267-5600
Wayne Bulhoul	City of Brunswick	(912)267-5570
Bill Powell	City of Brunswick	(912)267-5509
Herb Schwabe	Bryan County	(912)756-3961
Kip Kirby	Red Cross	(912)884-2234
Leo Melanson	Red Cross	(912)876-6797
Charles Richardson	Board of Education	(912)876-2161
Irving W. Drought	A.R.C.	(912)355-9582
David C. Sapp	L.C. Public Works	(912)884-3310
Mike Stewart	Co. Administrator	
Thomas Burriss	Liberty County EMA	(912)368-2201
Jerri Futch	Liberty County EMA	(912)368-2201
D.L. Burkhalter	Chatham Co. Police	(912)352-7780
Bill Schumacher	City-Public Works	(912)235-4210
John Wacz	Chatham County Public Works	(912)354-0402
J.J. Bayedes	Savannah Police Department	(912)235-3596
Tina Spivey	American Red Cross	(912)651-5300
Art King	Co. EMA	
John Felder	CEMA	(912)651-3100
Jim Woods	Tybee Island P.D.	(912)786-5600
Hansel Jenkins	Chatham County S.O.	(912)944-4616
Don Mundono	City of Savannah	(912)235-4090
George Fidler	City of Savannah	(912)235-4125
Paul Johnson	WSAV-TV	(912)651-0300
Joe Torres	WSAV-TV	(912)651-0300
Mark Kreuzwieser	Savannah News Press	(912)236-9511
Cedric Magwood	WTOC-TV	(912)234-6397

Lewis Dotson	Chatham Co. Emerg. Preparedness Dir.	
Richard Shepherd	WTOC-TV	(912)234-6397
Natalie Hendrix	WJCL TV-22	(912)925-0022
Dave Williams	WJCL TV-22	(912)925-0022
Al Manning	GEMA	(404)624-7030
Glenn Woodard	FEMA	(404)853-4400
Jim Hill	GEMA	(404)624-7040
Jim Wilbanks	GEMA	(404)624-7021
Dave Moffet	GEMA	(404)624-7044
Julian Bockner	GEMA	(404)624-7045
Jim Stockelman	GEMA	(404)624-7000
Billy J. Clack	GEMA	(404)624-7000
Dennis Clark	Chas. Co. EPD	(803)554-5951
Robert Occhifinti	COE Charleston	(803)724-4678
David C. Harris	COE, Charleston	(803)724-4631
Jamie Thomas	Charleston County PIO	(803)720-2231
Bill Miller	Chas. Co. Director of Planning	(803)723-6739
Tom Stockdale	Area Coordinator	(803)734-8020
Cathy Haynes	Chas. Co. EPD	(803)554-5951
John Burbage	Post-Courier	(803)577-7111
Larry Tarleton	Post-Courier	(803)577-7111
Charles Griffith	Colleton Co. Emer. Preparedness	(803)549-5632
Theresa Brown	Jasper Co. Emer. Preparedness	(803)726-3173
Jerry Smith	WPDQ Radio - Jacksonville, Florida	(904)264-4523
Deborah Jibbetts	WCIV-TV, Charleston	(803)881-4444
Hope Moorer	WCIV-TV, Charleston	(803)881-4444
Joe Connally	SCEPD	(903)734-8020
Jim Silva	SCEPD	(803)734-8020
Tom Beckham	SCEPD	(803)734-8020
Francis Tubolino	SCEPD	(903)734-8020
Charlotte Sottile	S.C. ETV	(803)737-3351
William Winn	Beaufort Co., SC Emergency Prep.	(803)525-7353
E.T. Harrison, Jr.	Horry County Civil Defense	(803)248-1225
Jane Hindmarsh	California OES	(916)427-4285
M.L. Bellamy	City of North Myrtle Beach	(803)249-0222
Teresa Long	H.C. Civil Defense	(803)248-1225
Dan E. Summers	New Hanover Co. Dept. of Emer. Ser.	(919)341-4300
Patricia Byrd	Georgetown Co. Civil Defense	(803)546-6869
Eddie Carraway	Georgetown Co. Civil Defense	(803)546-6869
Tom Hinton	Carteret Co., NC Emer. Director	
Karen Wagley	Onslow Co., NC Emer. Management	
Cecil Logan	Brunswick Co., NC Emer. Management	
George Spence	Dare Co., NC Emer. Management	

APPENDIX B

National Hurricane Center's
Hurricane Hugo Warning Summary/Timetable

Warning Summary, Hurricane Hugo, September 1989

date/time (military/EDT) action	location
15/1500 hurricane watch	St. Lucia through St. Martin and the British Virgin Islands
tropical storm watch	Barbados and St. Vincent
15/1800 hurricane warning	St. Lucia through St. Martin and the British Virgin Islands
tropical storm warning	Barbados and St. Vincent
hurricane watch	U.S. Virgin Islands and Puerto Rico
15/1900 hurricane warning	Martinique and Guadeloupe
16/1500 hurricane warning	Puerto Rico and U.S. Virgin Islands
tropical storm warning	St. Lucia
tropical storm warning discont.	Barbados and St. Vincent
17/0600 tropical storm warning discont.	St. Lucia
17/0900 hurricane warning discont.	Martinique northward through Barbuda
17/1200 hurricane watch	Dominican Republic: La Romana to Puerto Rico
17/2100 hurricane watch	Southeastern Bahamas and Turks and Caicos Islands
hurricane warning discont.	St. Martin and surrounding islands
17/2230 hurricane warning	Dominican Republic: La Romana to Puerto Rico
hurricane watch	Dominican Republic: Puerto Plata to Montecristi and La Romana to Caucedo

date/time (military/EDT) **action**	**location**
18/900 hurricane warning	Southeastern Bahamas and Turks and Caicos Islands
18/1800 hurricane watch discont.	Dominican Republic: Puerto Plata to Montecristi and La Romana to Caucedo
18/2100 hurricane warning discont.	Puerto Rico, U.S., and British Virgin Islands
18/2230 tropical storm warning	Dominican Republic: La Romana to Puerto Plata
19/0300 tropical storm warning discont.	Dominican Republic
19/1200 tropical storm warning	Southeastern Bahamas and Turks and Caicos Islands
hurricane watch	Central Bahamas
19/2230 tropical storm warning	Central Bahamas
tropical storm warning discont.	Turks and Caicos Islands
20/0600 tropical storm warning discont.	Southeastern Bahamas
tropical storm warning	Northwestern Bahamas
20/1200 hurricane watch	Abaco and Grand Bahama Islands
all other warnings discont.	Bahamas
20/1800 hurricane watch	St. Augustine, FL to Cape Hatteras, NC
21/0600 hurricane warning	Fernandina Beach, FL to Cape Lookout, NC
tropical storm warning and a hurricane watch	St. Augustine to Fernandina Beach
hurricane watch	Cape Lookout to Cape Hatteras

date/time (military/EDT) action	location
21/1200 tropical storm warning and a hurricane watch	North of Cape Lookout to Virginia Beach, VA
tropical storm watch	North of Virginia Beach to Cape Henlopen, DE
21/1500 hurricane warning	Cape Lookout to Oregon Inlet, NC including Pamlico Sound
tropical storm warning and a hurricane watch	North of Oregon Inlet to Cape Henlopen including Albermarle Sound and Chesapeake Bay
21/1800 all warnings discont.	South of Fernandina Beach
22/0400 all warnings discont.	Savannah southward
22/0600 all hurricane warnings discont.	
22/0900 tropical storm warning	Virginia Beach to Manasquan, NJ
tropical storm warning discont.	South of Virginia Beach
22/1200 tropical storm warning discont.	Virginia Beach to Manasquan
tropical storm wind warning	Coastal and offshore waters Cape Henlopen to Eastport, ME
23/0100 gale warning	NJ through New England

Source: National Hurricane Center Preliminary Report Hurricane Hugo