SUMMARY AND RECOMMENDATIONS

This report presents the results of an assessment of the use and the value of products of the Hurricane Evacuation Studies (HES) available in the coastal areas of Alabama and Western Florida impacted by Hurricane Opal on October 4, 1995. Similar assessments were performed after recent major hurricanes including Hurricane Hugo (1989), Hurricane Bob (1991), Hurricane Andrew (1992), Hurricane Iniki (1992), and Hurricane Emily (1993). These assessments are one of the means employed by the Federal Emergency Management Agency (FEMA) and the U.S. Army Corps of Engineers to continuously improve Studies and to learn how they can be used more effectively in state and local hurricane evacuation planning.

The Hurricane Opal evacuation did not go smoothly. The evacuation network was not cleared prior to the arrival of pre-hurricane landfall hazardous conditions; some evacuees returned home because of traffic congestion; and for a number of hours on October 4 there was a real possibility that thousands of evacuees were going to be caught by violent winds on open highways. Fortunately, Opal weakened significantly just before landfall and evacuees were not subjected to the core winds of a major hurricane. One death, caused by a tornado, occurred in the Florida Panhandle.

It would be difficult to construct a hurricane evacuation scenario more difficult for an emergency manger to cope with than the one provided by Opal on Tuesday, October 3. Opal was the third hurricane of the 1995 season to threaten the region and, while the winds of Hurricane Erin in August had caused significant wind damages, neither of the two earlier storms went beyond minimal hurricane intensity nor caused human casualties in the Alabama-Florida Panhandle region. The relative weakness of these storms may have reinforced a tendency for the public to take a "wait and see" attitude regarding Opal. There had been some post storm second guessing of one county's decision to order evacuations and to close schools for Hurricane Allison in June.

Throughout the crucial period of Tuesday afternoon and evening Opal had to compete for the attention of the news media with coverage of the verdict of the most publicized murder trial in history. In addition, Yom Kippur, the solemn Jewish holiday, began at sunset Tuesday, thus presenting an additional complication to public information during a crucial period in Opal's approach.

Like Hurricane Andrew in 1992, Opal evolved from a tropical storm to a strong Category 4 hurricane in 48 hours. Opal's pace of intensification quickened especially during the twenty-five to

five hours preceding landfall, going from a Category 1 to a Category 4 during this period. At the same time the storm's forward speed increased significantly. The final strengthening occurred late during the night Tuesday and early Wednesday, after some of the counties had set evacuation timetables for a less intense hurricane, and after vulnerable households had made plans to leave Wednesday by noon. When Wednesday morning brought with it the realization that a Category 4 hurricane was bearing down on the Florida Panhandle the stage was set for the all-at-once loading of the evacuation network and the resultant frightening traffic jams. To further aggravate the traffic situation highway construction significantly reduced traffic capacity on Interstate 10 and several other major evacuation routes.

This assessment addresses the subject of evacuation timing in some depth and makes suggestions about how to promote more appropriate public responses in future hurricanes. The need for coordination and the recognition of hurricane evacuation concerns in construction scheduling and maintenance of traffic plans has been recognized by the Florida Department of Transportation and state and local emergency management.

However, even if clear and coordinated evacuation orders had resulted in a prompt public response Tuesday evening, October 3, and even if all evacuation routes were able to handle their design traffic capacities, it is not assured that a successful evacuation could have been accomplished. Clearance time data available to the five westernmost Florida counties and to the two coastal Alabama counties was developed by the 1986 Tri-State Hurricane Evacuation Study (five Florida, two Alabama and three Mississippi counties). Housing and population data used in the Tri-State Study were obtained from the 1980 census and were already critically obsolete in 1990. By 1990 the total year round population of the six counties in the Tri-State Study area east of Mobile Bay had increased by 24 percent and total housing units by 42 percent. Growth was generally concentrated in the southern, or coastal, portions of the counties, the portions most affected by hurricanes.

In response to the major changes in population housing in coastal Northwest Florida and the request of the State of Florida, FEMA and the Corps of Engineers initiated the Northwest Florida HES in 1994. The availability of funding, however, has slowed the performance of the study. At the current pace of funding neither county level internal clearance times nor regional bottleneck clearance times will be available in time for the 1996 hurricane season. It is essential that the Northwest Florida Hurricane Evacuation Study be promptly funded.

Besides the problems relating to the age of the Tri-State Study data, it did not appear that the evacuation decision making data and tools provided by that Study or the Draft Apalachee Bay Region

HES were totally used to their best advantage during Hurricane Opal. Several counties in the Apalachee Bay Region were not yet familiar enough with the tools to value or use them or did not have ready access to National Hurricane Center advisories. Several counties in the Tri-State Study area used components of the data and tools, but do not appear to have used them in the systematic fashion implicit in their design. This assessment concludes that instruction in the use of HES data for new County emergency managers and refresher sessions for veteran managers should be provided periodically. It also concludes that in depth briefings of HES study results and decision making issues and operations should be made available to components of local government whose understanding and cooperation are necessary for successful evacuation decision making and implementation. These would include county commissioners, sheriffs' departments, school boards and administrators, health and social service departments, etc. Corps of Engineers Districts should be funded to stay involved in training and other HES related activities.

A synopsis of specific conclusions and recommendations and information items generated by this assessment follows. Chapters two through seven provide background and more detailed treatments of these subjects. Agencies assumed to have primary interest and/or responsibility are listed for each conclusion/recommendation. Also, recommendations considered to need immediate attention are so noted. Not all conclusions or information items carry with them a specific recommendation. These are rather offered because of their potential interest to various agencies. Some items included in the synopsis or in the main body of this report are concerned with subjects not directly associated with hurricane evacuation studies but related to hurricane evacuation operations in general (e.g., communications hardware). These items are also offered because of their potential interest.

Finally, it is also recognized that many subjects covered by this assessment are already being addressed by a variety of local, state and federal agencies.

POST-HURRICANE OPAL HURRICANE EVACUATION STUDY ASSESSMENT
CONCLUSIONS AND RECOMMENDATIONS

SUBJECT: HURRICANE EVACUATION STUDY PROGRAM AND ANALYSES

Mobile District - Corps of Engineers

➜ A first level evacuation traffic analysis of Florida/Alabama northbound roads and connections to Interstate 65 and other major evacuation routes should be conducted in order to:

1) Establish as reliable as possible estimates of regional clearance times (Alabama, Northwest Florida, Georgia) pending completion of the Northwest Florida HES and other components of the new "Tri-State" studies currently planned for the region.
2) Test the effects on regional clearance times of road widening, reverse laning or new roads.

Mobile District - Corps of Engineers

➜ Northwest Florida HES evacuation traffic should be examined for its impacts for the Apalachee Bay Region HES and vice versa. The compatibility of Northwest Florida HES data and Apalachee Bay Region HES data should be ensured. [Note: the ongoing Florida Statewide Hurricane Transportation Analysis will obviously be of relevance to this and the preceding recommendation].

Mobile District - Corps of Engineers
Corps of Engineers HES Mgmt Districts

The Tri-State Study did not explicitly treat inland county clearance times. The traffic congestion experienced in inland counties in Florida and Alabama affirms the necessity of the regional approaches taken in more recent studies. The Northwest Florida HES should include regional traffic modeling. Regional clearance times may be just as important as coastal clearance times in planning for a safe and timely evacuation.

All hurricane evacuation studies should carefully examine potential regional traffic issues.

FEMA/Army Corps of Engineers

➜ There have been very large increases in population and housing units in the Alabama and Florida portions of the Tri-State HES study area since it was published in 1986. Given the highway chaos that occurred during Hurricane Opal it is imperative that the Northwest Florida Hurricane Evacuation Study proceed quickly.

FEMA/Army Corps of Engineers

Given the huge increases in housing units in Baldwin County, Alabama, a high priority should be given to a restudy of the Alabama counties included in the Tri-State HES. Alternately, consideration

➜ Indicates recommendation needing immediate attention.

should be give to the addition of Mobile and Baldwin Counties to the NW Florida HES.

Mobile District - Corps of Engineers

Housing and population changes in the Mississippi portion of the 1986 Tri-State HES should be checked to learn whether an HES update is indicated. The character of the Gulfport-Biloxi coast has changed significantly in recent years due to the coming of the gaming industry.

Mobile District - Corps of Engineers

As in many HES study areas significant non-surge areas in the Northwest Florida HES Study are currently included in evacuation areas because of the potential for isolation by flooding. Examples include barrier island communities such as the City of Destin in Okaloosa County as well as non-barrier island localities such as Escambia County south of US 98. Given the large population growth in the southern portions of the study area and the expected resultant increases in clearance times, and notwithstanding the hazards associated with being cut off from other non-surge areas, there may be some areas where non-surge evacuation policies should be reexamined. Evacuation zones for the Northwest Florida HES should be drawn in close consultation with county emergency management directors and with close attention to issues such as isolation.

Mobile District & Other
Corps HES Mgmt Districts

Attention should be paid to the clarity of the descriptions of evacuation zone boundaries as these zones may be used in public information products. Assistance should be made available to counties that desire help in developing customized storm surge or evacuation zone maps.

Mobile District - Corps of Engineers
FEMA REGION IV
County Emergency Management

Housing unit increases for 1980-1990 in the nine Apalachee Bay Region HES study area counties (four coastal and five inland counties) ranged from twenty-six to forty-one percent. Assuming that this growth is likely to continue, vulnerability data for this region should be frequently updated.

Mobile District - Corps of Engineers

Mobile housing units and population in Holmes and Washington Counties were not included in the 1986 Tri-State HES. Given the large numbers of these units and their potential impact on evacuation traffic, they should be addressed in the vulnerability analysis and included in the transportation analysis of the Northwest Florida HES and in regional analyses suggested in (1.) above.

SUBJECT: EVACUATION DECISION MAKING TRAINING & REVIEW

Mobile District - Corps of Engineers
Jacksonville District - Corps of Engineers
FEMA REGION IV
Florida DEM

➜ Table top exercises in the use of HES decision making tools and available computer decision making aids should be scheduled for county emergency management officials. There has been an almost complete turnover in Tri-State HES county emergency directors in Alabama and Florida since the Study was completed. Refresher exercises should be held frequently. Opal advisory data would provide excellent material for a table top exercise.

All coastal counties should be provided with full access to National Hurricane Center advisories.

FEMA/Corps of Engineers Hdqtrs.
Corps of Engineers HES Mgmt Districts

Corps of Engineers Districts in cooperation with state emergency management agencies (EMA's) should offer instruction in the use of HES data for new County emergency managers and refresher sessions for veteran managers periodically (i.e. at least every two years). Corps of Engineers Districts that do not have a study or restudy in progress should be funded to stay involved in HES related activities such as local training, review of data, etc.

FEMA/Corps of Engineers Hdqtrs.
Corps of Engineers HES Mgmt Districts
State Emergency Management Agencies

The understanding and cooperation of many elements of local government are essential for successful evacuation decision making and implementation. While many emergency management agencies (EMA's) have been able to build and maintain the needed supportive relationships with their elected officials and other agencies and offices, it is apparent that many EMA's could use assistance. Briefings, seminars, workshops or other vehicles for the education of elected officials and support agencies should be made available to jurisdictions as new hurricane evacuation studies are concluded, revisions completed, or as otherwise needed (recent elections, agency turnovers, length of time since last workshop, etc.) This type of activity should be included in budgeting for hurricane evacuation studies and for ongoing Corps of Engineers District involvement.

➜ Indicates recommendation needing immediate attention.

FEMA Region IV
Mobile District - Corps of Engineers

➜ Several county emergency directors in the Apalachee Bay Region HES study area indicated that they were not familiar with, or ignored, data produced by the draft study. It seems advisable that a renewed effort be made to acquaint these directors with the study and its potential usefulness.

County Emergency Management
Florida DEM

Coordinated decision-making among jurisdictions is a significant factor in the success or failure of any regional evacuation. During Opal various emergency managers altered evacuation plans yet failed to communicate these changes to other jurisdictions that would experience impacts from those changes. Also, some emergency managers had difficulty coordinating with decision makers within their own counties. Procedures for decision-making must be established across jurisdictions, thereby minimizing the chances of conflicts and redundancies.

SUBJECT: TRAFFIC CONTROL

Florida Department of Transportation
County Emergency Management

➜ State Departments of Transportation should consider hurricane evacuation concerns in highway construction scheduling and maintenance of traffic plans and should work with emergency management and traffic control personnel (in-state and out-of-state) to mitigate the impedance of hurricane evacuation traffic.

Florida Department of Transportation

Traffic counters have proven very useful in recent evacuations in testing public response and traffic flow assumptions. It is recommended that Florida DOT consider the need for hurricane evacuation traffic data in its placement of counters.

Florida Department of Transportation
Florida DEM

Several counties expressed the need for additional signs for evacuation routes.

➜ Indicates recommendation needing immediate attention.

SUBJECT: PUBLIC EDUCATION, PUBLIC INFORMATION, PUBLIC WARNING

County Emergency Management
Florida DEM

There is a continuing need for up-to-date printed materials such as brochures and pamphlets that remind the public and tourists that an area is subject to hurricane hazards and provides general evacuation information. These materials should be available at tourist welcome and information locations, hotel/motel lobbies and rooms, etc. Evacuation zones, evacuation routes, shelter locations and at least rudimentary evacuation concepts should be covered.

County Emergency Management

➜ It is likely that a significant percentage of Opal evacuees were non-surge residents who either were not aware of their non-surge status, or who were prompted to leave by the Wednesday morning Category 4 status of Opal. The fact that five people were killed by Opal related winds in the Atlanta area while one person was killed by winds in Florida (a tornado in Crestview, Okaloosa County) points out the need for explicit public policies regarding who should evacuate under what circumstances; a clear communication of these policies; and public education regarding these policies and the justifications for them.

County Emergency Management

➜ It is recommended that counties in the Opal impact area, in preparing for the 1996 hurricane season, make a concerted effort to impart to the public an education in clearance times and related concepts. It is also recommended that extreme care be given to the wording of evacuation orders. The delayed behavioral response curve observed in Opal suggests the need for evacuation decision makers to be aware of the factors influencing the promptness of public response and ramifications for timely evacuations.

Florida DEM
Weather Channel

Several counties believe that dependence on the Weather Channel, whose information on local conditions or anticipated conditions may lag behind local information, may have hindered timely reception of, and response to, evacuation orders. It is recommended that the Weather Channel and Florida Division of Emergency Management continue to seek ways to impress on the public the importance of attention to local emergency management.

➜ Indicates recommendation needing immediate attention.

Florida Division of Emergency Management

Several counties not close to media centers such as Pensacola or Panama City had difficulty disseminating information unique to their situations.

County Emergency Management Agencies

Several counties maintain unlisted phone numbers to be used by local media to call emergency managers for information to be relayed to the public. Availability of these numbers assured TV and radio stations access to essential information.

County Emergency Management Agencies

Automated fax systems to provide information to broadcast media were used in Opal by Florida DEM and by several county EMA's with apparent success. It was also suggested that state and county highway patrol agencies compile a list of media and fax numbers to provide TV and radio stations with traffic and shelter information.

County Emergency Management Agencies

Law enforcement and fire personnel were effectively utilized in Opal for neighborhood alerting. In at least one county there was a lack of cooperation by sheriff's department probably rooted in a lack of conviction that an evacuation was necessary. This may have contributed to the slow start of the evacuation and affirms the value of this type of notification.

County Emergency Management Agencies

The primary evacuation route used by Gulf County evacuees was State Highway 71. US 98 was open but relatively unused as many people believed it to be flooded. The lack of local media outlets contributed to this problem.

County Emergency Management Agencies

Cellular phones were extensively used by evacuees during Opal to report traffic conditions to local radio stations, which were able to pass on this information via radio stations to other evacuees attempting to find less congested routes and to avoid construction, road flooding, etc. Some of this information was incorrect and in conflict with information being disseminated by the counties. Local EMA's and radio station managers may wish to consider how the effectiveness of cellular phone use can be enhanced, especially in coastal areas that do not have everyday media traffic information resources, and how the accuracy of this information can be insured.

SUBJECT: COMMUNICATIONS

Gulf County, which is one of the counties lacking in TV/radio service, noted a potentially critical problem with the telephone company facilities in Port St. Joe. The building housing the phone lines is within a mile from the coast in a surge vulnerable location. Steps to mitigate this problem should be considered to avoid loss of long distance communication and resultant isolation.

SUBJECT: SHELTERING

The following shelter related issues and concerns surfaced during the Hurricane Opal evacuation:

- The need for outside assistance in identifying suitable structures for use as public shelters.
- The need for public sheltering to be recognized as a regionalized function.
- Reluctance of some local school boards to be partners in public shelter planning and implementation.
- Reluctance of state colleges to allow the use of college buildings as public shelters.
- The need for clarification of compensation and liability for non-governmental shelter management agencies as well as host jurisdictions.
- The need to educate the public in non-surge areas regarding the nature of hurricane hazards and the possible mitigation of wind hazards, in order to limit unnecessary evacuations.
- Evacuation and care of hospital and nursing home residents and other special needs citizens.
- Personnel support and other resources to accompany out-of-county evacuees, especially special needs evacuees.
- Registration of shelter occupants

As mentioned in Chapter 4 of this report, none of these issues are new. Each is addressed by the 1993 Lewis Report which was published by the Governor's Disaster Planning and Response Review Committee following Hurricane Andrew. The Report provides detailed recommendations regarding shelter issues.