

Natural Hazard Research

HUMAN RESPONSE TO HURRICANES IN TEXAS
-Two Studies-

by

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HUMAN RESPONSE TO HURRICANES IN TEXAS--TWO STUDIES

Rapidly increasing development on the Texas Gulf is currently exposing over 3.5 million residents to major risks from hurricanes. Those persons living on the many barrier islands and low-lying communities fronting the Gulf of Mexico are particularly vulnerable to hurricane destruction.

The two studies discussed in this paper examined human adjustment, response, and perception of the hurricane hazard in several extremely hurricane-prone communities on the Texas coast. The first study centered on Galveston Island, which has not experienced a major hurricane since 1961. Open-ended interviews were conducted to determine the awareness and attitudes of local officials and residents toward hurricanes, as well as to determine what adjustments had been made to the hazard. Results indicated that, although the community of Galveston is fairly progressive in its emergency preparedness efforts, there remain definite elements in the city who refuse to evacuate and, furthermore, take a somewhat defiant "stick-it-out" posture in regard to hurricanes.

The second study discussed in this paper surveyed the perception, response and future actions of selected South Texas coastal residents in three communities who experienced the threat of the near-miss Hurricane Anita in September of 1977. In general, the level of preparedness for Anita was found to be high in all three communities, and most residents indicated that they would make the same preparations next time a hurricane threatened their community.

TABLE OF CONTENTS

List of Tables.....	v
List of Figures.....	v
Preface.....	vi
Acknowledgements.....	vii
Introduction.....	1
Related Studies.....	2
Galveston Island Study.....	3
Background.....	3
Methodology.....	6
Results.....	7
Response to Hurricane Anita.....	21
Background.....	21
Watch and Warning.....	24
Methodology.....	24
Results.....	26
Recommendations for Future Research and Actions.....	31
Relationship Between Galveston and Post-Anita Studies.....	33
Bibliography.....	36
Appendix.....	41

LIST OF TABLES

TABLE

1	Galveston Island - Hurricane Adjustments.....	8
2	Post-Anita Survey Conclusions.....	22

LIST OF FIGURES

FIGURE

1	Map of Galveston Island.....	5
2	Location Map of Post-Anita Survey Communities.....	25

PREFACE

This paper is one in a series on research in progress in the field of human adjustments to natural hazards. It is intended that these papers will be used as working documents by the group of scholars directly involved in hazard research as well as inform a larger circle of interested persons. The series was started with funds granted by the U.S. National Science Foundation to the University of Colorado and Clark University but now is on a self-supporting basis. Authorship of papers is not necessarily confined to those working at these institutions.

Further information about the research program is available from the following:

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Requests for copies of these papers and correspondence relating directly thereto should be addressed to Boulder. In order to defray production costs, there is a charge of \$2 per publication on a subscription basis or \$3 per copy if ordered singly.

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INTRODUCTION

Tremendous development rates are currently exposing over 3.5 million Texans to major risk from hurricanes. All coastal areas of the United States are being developed at increasing rates with little regard for the interaction between the human system and the natural elements of the shore. Over one-third of the nation's population now lives in coastal counties, and human settlement within one mile of the shore has been increasing at more than three times the natural growth rate (White and Haas, 1975).

Approximately 30% of the population of Texas resides in the coastal area (29 counties including those immediately adjacent to the Gulf and second-tier counties) which represents only one-tenth of the state's land area. Between 1960 and 1970, the population of the 18 Texas coastal counties bordering the Gulf of Mexico increased 24.8%, as compared with 16.9% of the state and 14.2% for the nation. These same trends are continuing in the 1970-1980 decade.

The rapidly increasing population and development on their coast has alerted Texas state officials and disaster preparedness officials to the need for more data on human response to the hurricane hazard. In addition, the sponsors of the Texas Hurricane Awareness Program* are extremely anxious to obtain information concerning human perception and adjustment to hurricanes in Texas for incorporation into program goals and content. Thus, in the hope of contributing to the current knowledge of

*This public information program has been in existence since 1974 and is co-sponsored by the Texas Coastal and Marine Council, the Governor's Division of Disaster Emergency Services and the Texas Catastrophe Property Insurance Association.

human adjustment and response to the hurricane hazard, this researcher has conducted two studies on the Texas coast: (1) an evaluation of the human adjustment to hurricanes on Galveston, including a determination of the attitude and awareness of Galveston citizens and officials toward the hurricane hazard, and an investigation determining the presence and effectiveness of six specific types of adjustments to the hazard;* and (2) an attempt to determine perception of, and response by residents to Hurricane Anita, which threatened the Texas coast in September of 1977. The results and conclusions from both studies will be discussed separately and relevant relationships between the studies will be noted.

RELATED STUDIES

Previous studies of hurricane-prone communities in the U.S. have yielded observations which have ultimately led to advancement of the understanding of man's likely adjustment and response to hurricanes. Harry E. Moore (1964) in his study of response to Hurricane Carla, first put forth the concept of a "disaster culture" which will be discussed in detail later in this paper. Ian Burton et al. (1969) made the first attempt to systematically study man's choice of adjustments to coastal flooding. Wilkinson and Ross (1970) in their study of Hurricane Camille, observed that although many inappropriate actions are taken in response to a hurricane, these actions do not appear to be inappropriate until viewed in retrospect with all facts known.

*Davenport, Sally S., Human Adjustment to the Hurricane Flood Hazard on the Texas Coast, Unpublished Master's Thesis, University of Texas at Austin, Austin, Texas, 1976.

In studying the response to Hurricane Eloise, Baker et al. (1976) and Windham et al. (1977) found that newcomers to hurricane-prone areas were more likely to evacuate than those who had lived in the community several years, and, that further, the complacent attitudes of the "oldtimers" often influenced the newer residents after several years. In addition to the above studies centering on specific communities and/or hurricanes, an intensive general assessment of research needs in relation to human response to hurricanes, and natural hazards in general, has been undertaken (White and Haas, 1975; White et al. 1975; Brinkmann, 1975).

GALVESTON ISLAND STUDY

Background

Galveston Island is a barrier Island which is approximately 30 miles in length, varying in width from one-half to three miles and separated from the Texas mainland by Galveston and West Bays. The City of Galveston includes all but the westernmost tip of the Island. Much of the eastern end of the Island, where most of the city is located, was raised substantially through filling when the 15 foot seawall was constructed in the early 1900's. At present, the top elevation behind the seawall is about 17 feet above mean sea level. Northeast of Seawall Boulevard and west of the seawall, the land varies from five to seven feet in elevation (Figure 1). Where the beach has been left undisturbed, it creates a line of barrier dunes held in place by vegetation growing along the line where the usual wave crest ends. In places, the barrier dune has been removed to expand the beach or to allow the construction of recreational housing (City of Galveston Planning and Traffic Dept., 1973). A general slope exists from the crest of the Island

to the bay, and a substantial band of sensitive marsh area runs along the bay.

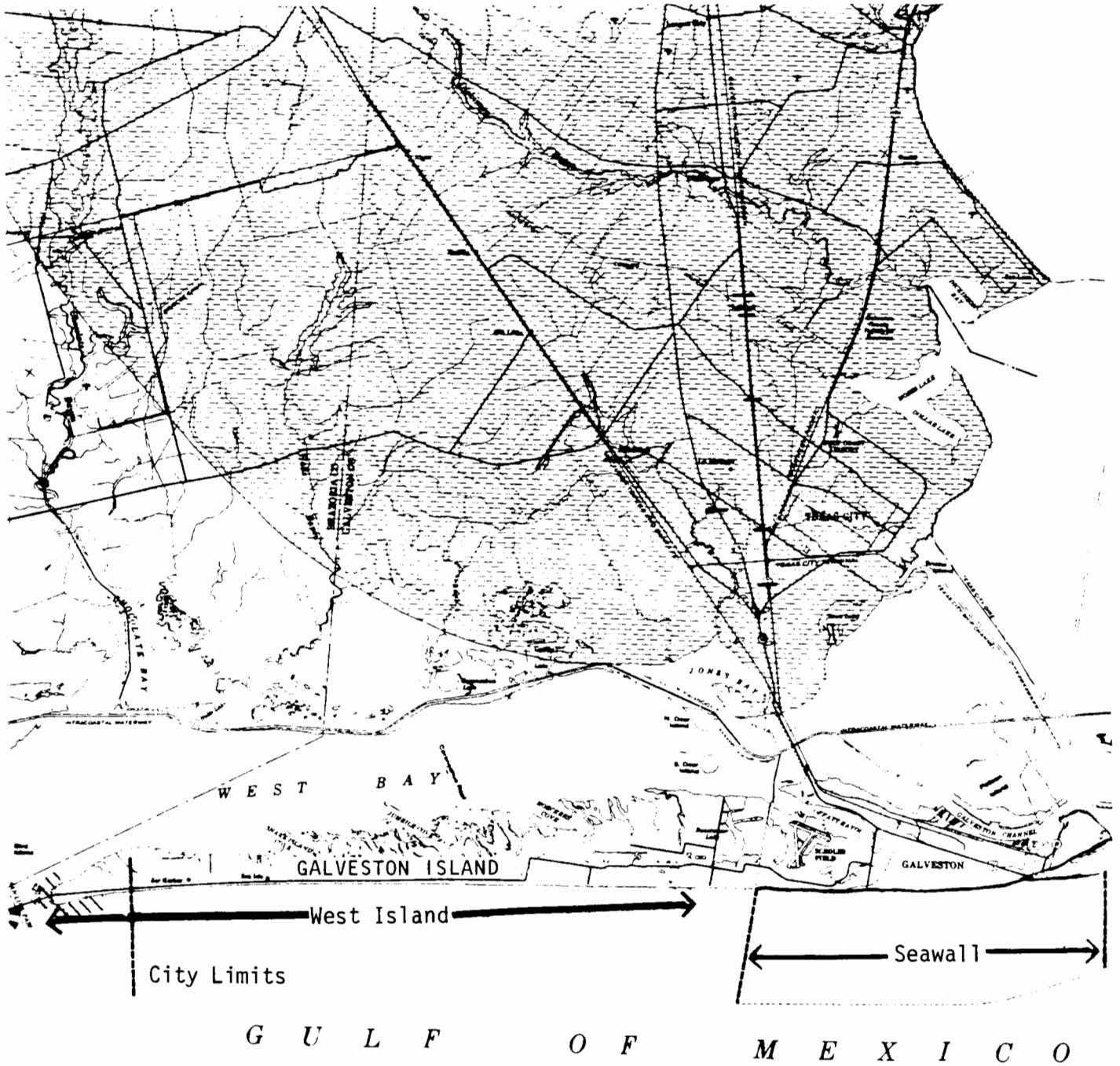
Galveston Island was chosen for study for several reasons: (1) the importance of barrier islands in hurricane protection, (2) the increasing development pressure on the Island, and (3) the availability of information on past responses of Galveston Island to the numerous hurricanes which have struck through the years. Further, the residents of Galveston Island share many of the same flood hazard problems of people located on the mainland coast, as well as deal with the special problems connected with barrier island dwelling.

The current population of Galveston Island is approximately 68,000 people. Pressure for growth beyond the west end of the seawall has intensified sharply since the City of Galveston annexed almost all of the rest of the Island in 1977. In 1973, a total of 1,878 dwelling units were inventoried on West Island, 1,496 of which were in subdivisions. The economy of the Island is centered around resort-vacation activities, a medical education center, and port and shipyard industries.

As a barrier island, Galveston receives the full force of the hurricane's destructive forces. In the great 1900 hurricane, over 6,000 lives were lost on the Island, and historically, there is an 18% chance during any one year that a hurricane will strike Galveston Island. However, a major storm has not struck the upper Texas coast since Carla in 1961.

Compounding the hurricane problem is the fact that six foot tides would virtually isolate Galveston Island from the mainland. The road elevations on the major escape route from the Island, IH 45, are down to five

FIGURE 1
GALVESTON ISLAND



Source: Brown, L.F., Jr., Robert A. Morton, Joseph H. McGowen, Charles W. Kreitler, W.F. Fisher, Natural Hazards of the Texas Coastal Zone: University of Texas at Austin, Bureau of Economic Geology, 1974.

feet above mean sea level due to severe subsidence. The second escape causeway, via the San Luis Pass Bridge at the extreme western end of the Island, is closed when tides reach three feet. The final means of escape, the ferry from Galveston Island to Bolivar Peninsula, ceases operation when the tides reach five feet or wind velocity reaches forty knots. Eight hurricanes with tides above 10 feet above mean sea level and winds above 140 mph have struck the upper Texas coast this century. Carla had tides between 15-22 feet above mean sea level and winds in excess of 135 mph (Benton, 1974).

Methodology

This study attempted to determine the attitude and awareness of island residents in regard to hurricanes, and the existence and effectiveness of six types of adjustments to the hurricane hazard on the barrier island of Galveston. The types of adjustments specifically investigated included warning-emergency action programs, relief and rehabilitation plans, flood-proofing, protective works, flood insurance and land use management.

The research involved a literature search and personal interviews with state officials who were knowledgeable about adjustment to hurricanes on the state level as well as about problems specific to the Island. A field study was then conducted on the Island including visits with officials of the U.S. Army Corps of Engineers, Galveston District, city and county government, the National Weather Service in Galveston, Red Cross, local media, representatives of local developers, selected community leaders, and finally a small number of "man-on-the-street" representatives. From the information obtained in these open-ended interviews, observations were made on the status of

Galveston Island's adjustment to hurricane hazard and on the awareness and attitude of local officials and citizens toward the hazard. It is the latter section on the attitudes and awareness which will be emphasized in this report.

No attempt was made to randomly sample officials or citizens; the method of investigation was to contact as many Galveston representatives as possible. Questions were asked concerning the various hurricane adjustments under consideration, as well as questions concerning past and projected reactions to hurricanes. Responses were analyzed and divided into either attitudinal or informational context. Finally, the findings were applied to federal, state, and local policy considerations in order to aid the formulation of new directions in hurricane adjustments for Galveston Island and Texas in general. Recommendations were also made in relation to federally sponsored research and adjustment programs.

Results

Adjustments to the hurricane hazard. The results of this investigation plus some suggested actions are summarized in Table 1*. Basically, it was found that Galveston Islanders rely heavily, both psychologically and physically, on the 15 foot seawall which fronts approximately one-third of the Island. Floodproofing actions have been slow and minor through the years, but the Federal Flood Insurance Program has encouraged this adjustment at least in new construction efforts. Flood insurance was instigated early in Galveston with the strong support of local elected representatives, and a large percentage of residents have this insurance.

*This summary table was originally developed for the Galveston Island Study and has appeared in a slightly modified form as a model outline for possible adjustments to regional natural hazard problems in White et al., Natural Hazards Management in Coastal Areas, 1976.

TABLE 1
GALVESTON ISLAND--HURRICANE ADJUSTMENTS

ADJUSTMENT	EFFECTIVENESS	ACCEPTANCE	POSSIBLE ACTION
PROTECTIVE STRUCTURES	<i>Harmful or Ineffective</i>	GOOD--	Any future construction of protective structures should be part of a comprehensive disaster mitigation program which has been formulated for the Texas coast through consideration of a wide range of alternatives. Due to their significant impact on beach aesthetics and recreational opportunities as well as their great cost (\$1000/sq.ft. or \$5 mil./mile), protective structures should be very carefully studied before inclusion in a hurricane protection program.
	<i>Beneficial</i>	but some realization by local officials and residents of environmental damage caused by structures.	
	1. Causes erosion of beaches	1. Prevents property damage and can save lives	
	2. Creates false sense of security	also, local officials realize \$ cost is prohibitive to local governments.	
	3. Encourages development in hazard areas		
4. Destroys aesthetics and recreational opportunities of beach			
FLOODPROOFING	1. Can create false sense of security 2. Some poorly done floodproofing attempts can cause more damage	FAIR-- mostly new efforts done in connection with Flood Insurance Program. previous efforts scattered and token. Residents either ignorant of proper methods or apathetic.	The Model Minimum Building Standards for hurricane prone areas (S.R. 268), now being prepared, should be adopted by the State Board of Insurance and CATPOOL. The cooperation of local architects and builders will be required for implementation of the standards.

Table 1 (continued)

Governor can suspend unsafe construction practices in hazard areas and by regulation place new standards into effect (Texas Disaster Act 1975, Sec. 12d)

The enforcement of FIA building requirements for flood hazard areas should be carefully monitored to ensure compliance

3. Enforcement of new building codes a problem-- many variances granted
4. Not widely used in old residences

Assess the effects (social, economic, as well as disaster prevention) of the Federal Flood Insurance Program on coastal communities.

Investigate the possibility of establishing a Texas flood insurance pool-- much like the current wind storm pool-- thus privately financing costs rather than accepting Federal subsidy.

FAIR TO GOOD--

biggest % purchased in Texas--but still complaints over restrictions by developers and some residents

Large support by elected officials, especially county judge and state senator

1. Those who take most risk will bear more of cost burden-- saves tax-payers \$
2. Requires flood-proofing of structures

FLOOD INSURANCE

Require Comprehensive State Disaster Plan to include separate section on prevention and minimization of injury and damage due to hurricanes and other natural hazards as in Sec. 6b, Sec. 2(8) (TX Disaster Act of 1975)

FAIR--

most residents definitely aware of threat of hurricane hazard.

however, large number of B01's and long-term residents have philosophy of defying the storms, refusing to evacuate, "taking it," etc.

1. Local emergency plan vague in critical area of evacuation
2. Local emergency plan does contain special section on hurricanes
3. Local disaster coordinator unable to devote enough attention to preparedness

EMERGENCY PREPAREDNESS

Require each local disaster agency (county or municipal) to incorporate preventive measures into local plan as a condition for funds. (Now state can only review and recommend changes.)

Give Governor power to order evacuation from disaster-threatened area (now can only recommend).

Funds should be provided for a fulltime disaster coordinator for all urban

Local officials voluntarily participated in the Plans and Operations Course and Community

1. Local emergency plan does contain special section on hurricanes
2. Local officials voluntarily participated in the Plans and Operations Course and Community
3. Local disaster coordinator unable to devote enough attention to preparedness

Table 1 (continued)

Leaders Course sponsored by State Division of Disaster Emergency Services

coastal communities and for each rural county.

Local officials should clearly state evacuation policy and roles in Emergency Plan.

Governor can control ingress and egress from a disaster area [Sec. g(7)] He should assume this authority to reduce confusion in the immediate post-disaster period.

Amphibious vehicles should be required as part of every coastal disaster plan. State DBES should help local governments in acquisition of such vehicles.

To ensure beneficial long-term recovery a model 90-day post-disaster recovery plan should be included in the Comprehensive State Disaster Plan. An inter-disciplinary team approach (utilizing architects, planners, economists, sociologists, etc.) could be used and local reconstruction agencies could be formed using Title VIII funds from the Federal Disaster Relief Act of 1974.

Governor should carry out mandate in Texas Disaster Act of 1975 to require the TWDB to identify areas particularly susceptible to subsidence, flood or other catastrophes and to keep land use and construction of structures under study. The governor can suspend unsafe land use controls and place new controls in effect (Sec. 12 b,c,d).

Strengthen and enforce Dune Protection Bill.

1. Good immediate response and prior preparation by local citizens and officials.

Strong desire to move quickly on making repairs, cleaning up, etc.

1. No city or state policy on re-entry into disaster area

2. Lack of amphibious equipment

3. No long-term recovery or rehabilitation program provided for in Emergency Plan

RELIEF AND REHABILITATION

1. Some attempt to regulate traffic on beaches

2. Annexation by city of most of West Island, thus allowing more control of development.

Attitude still much more receptive on Galveston Island towards land

POOR--

1. Not used extensively in past, now only in connection with Flood Insurance Program

2. Failure to control development on W. Island resulted in damage to dunes

LAND USE MANAGEMENT

Table 1 (continued)

- | | | | |
|--|---|---|---|
| and sensitive land areas, shabby construction | 3. Some attempt to locate parks, golf courses, etc., in critical environmental areas. | management than extremely negative attitude present in Brazoria County. | Pass a workable disclosure act for natural hazards. |
| 3. Zoning plan has no connection with hurricane damage prevention | | | |
| 4. Purchasers of land (especially on West Island) are often not aware of the hazards involved. | | | |

The quality of local emergency preparedness is somewhat erratic, and appears to be more reactive than prevention-oriented. No major hurricane has struck the Island since Carla in 1961 (when several response problems occurred--see Table 1), and thus the quality of relief and rehabilitation plans is hard to determine. In general, however, the short-term relief plans appear to be adequate, although no provisions are made for long-term recovery from a major disaster. Finally, in regard to the adoption of wise land use practices to mitigate hurricane losses, Galveston Island has done very little. Local zoning plans do not attempt to encourage appropriate land use in areas most susceptible to hurricane damage, and the destruction or damage of dunes has been allowed to occur on West Island.

Attitude and awareness of hurricane flood hazard. The main discussion of this study will center on the attitudes and awareness of Galveston Island residents toward the hurricane hazard and the various adjustments to hurricanes. Before any decisions can be made on how best to reduce man's vulnerability to coastal flooding, there must first be a motivation on his part to reduce the flood hazard. This motivation can only come from the perception of danger and the knowledge of the available choices of hazard reduction. Occasionally, other sources not directly related to the hazard, such as land use plans and insurance regulations (designed for other purposes), may also serve to reduce hazard vulnerability. Unfortunately, from the viewpoint of many public officials, decisions on hurricane mitigation action to be taken are also made on the political basis of whether the action would contribute to their re-election to office. Several attempts, on both the state and local level, have been made to

educate Texas coastal dwellers on aspects of the hurricane hazard and on possible solutions to their situation. This study made an effort to determine the success of these hurricane awareness and public education programs on Galveston Island.

Galveston officials - The local officials of both Galveston County and the City of Galveston seem to have a higher level of awareness of the hurricane hazard than most of their counterparts in other Texas coastal cities. This higher awareness of hazard, and a consequently higher activism in the selection of hurricane adjustments, is especially evident in officials elected to higher political positions. The State Senator for Galveston, and several adjoining counties, A. R. Schwartz, has been a leader in advocating progressive programs and measures to protect both the people and environment of the Texas coast. Senator Schwartz's efforts on behalf of the coast include his chairmanship of the Texas Coastal and Marine Council, an effective legislative advisory body which is involved in hurricane awareness; his passage of wind storm insurance for high risk areas in 1971 through the Texas Catastrophe Property Insurance Association; and his repeated effort to obtain county ordinance powers for coastal counties*. Senator Schwartz, a native ("BOI" - Born on the Island) resident of Galveston Island, acknowledged that the Island is especially vulnerable to hurricanes, but that "unfortunately, people continue to be born and to live there" which makes a hurricane awareness program necessary. In addition, the Senator feels that although

*Currently, Texas counties (with the exception of two lower coastal counties, Cameron and Willacy) have no authority to regulate development through zoning, building standards, etc., in unincorporated areas.

disaster relief planning in Texas is well done, "preventative" programs which allow people to protect their lives and property are not established (Hill, 1974; Schwartz, 1975).

Galveston County Judge Ray Holbrook is another well-informed, strong advocate of a wise hurricane adjustment program. Holbrook has been an adamant proponent of the National Flood Insurance Program and has testified before the U.S. Senate as to the need for and effectiveness of the program, although he recognizes a need for more accurate mapping of flood hazard areas than has been achieved in the past. In order to promote the wise use of flood hazard areas, Holbrook has been instrumental in establishing the Galveston County Building Department to issue permits under the Southern Standard Building Code and the County flood regulations. Holbrook feels that "to allow millions of dollars worth of construction to be built where past history shows it will be destroyed and endanger lives is absolutely unthinkable, as well as unacceptable, to the taxpayers who have to pick up the bill for Federal Disaster Aid" (Holbrook, 1975; 1975a).

Galveston city officials are as aware of the existence of the hurricane flood hazard as county and state officials. However, the city officials appear to be divided as to the necessary response to the hazard. During Hurricane Carla, in 1961, Galveston officials had not accepted the civil defense plans which had been made. In addition, some of the key civil defense officials were new in their jobs and were not familiar with the plans. This situation resulted in seriously divided authority through the use of multiple headquarters and obvious confusion (Moore, 1963). Emergency planning for the City of Galveston has definitely improved since Carla. Nevertheless, some officials remain dubious as to whether evacuation

of Galveston Island can be accomplished, since escape routes could be cut off as early as 12 hours before the arrival of a hurricane. The slow-moving storm, Carla, with tides from 15 to 22 feet above mean sea level and heavy rainfall, isolated Galveston from the mainland for over 24 hours before making actual landfall at Port O'Connor (Benton, 1974). City officials also display a strong reluctance to commit themselves to forced evacuation of citizens. This reluctance is due either to a feeling that they really lack the authority to do so, or a fear of possible political backlash as a result of their actions.

City officials' attitude toward land use management and flood-proofing as adjustments to the hurricane flood hazard varies by department. The City Planning and Traffic Department is definitely in favor of stronger building controls and is very much aware of the vulnerability of most of the Island to hurricanes. At the same time, the Department moves cautiously because of the often conservative political climate of the City Council and Planning Commission. Too, there is a realization within the Planning Department that some urban expansion westward on the Island beyond the seawall is necessary for Galveston to maintain a sound economic climate and to promote certain social goals. Thus, the Department may de-emphasize some of the actual danger inherent in placing development on a barrier island without providing direct protection from tidal flooding.

This attitude of down-playing the hurricane hazard and emphasizing the inevitability of further growth is even more prevalent in the City Building Official's office. The director of the office feels that people will move to the Island despite the threat of hurricanes, "just like San Francisco", and that Galveston's growth should not be retarded because

of the 1900 storm. He seems also to feel that because there has not been a storm in so long that there will not be one, at least one that can not be handled, in the foreseeable future. In addition, the building director definitely favors the extension of the seawall across the West Island beachfront (Spears, 1975).

Views of the Galveston City Council towards land use management action to be taken in connection with the hurricane hazard are cautious. One council member expresses frustration over necessary land use decisions stating that it was "very hard to balance the needs of protection of life and property and all the varying needs and requests and feelings of the citizens who are directly involved" (Texas Coastal Management Program, 1976, p. 46). She does feel, however, that the citizen who lives or buys property in Galveston, especially West Island, needs to know what to expect in this high risk coastal area. On the other hand, some City Council and Planning Commission members feel that the city should stay entirely out of the controversial matter of hazard disclosure (Hinkley, 1975).

Local organizations - Two local organizations which are very concerned with the subjects of hurricane awareness and the necessity for protection of lives and property are the Galveston Regional Group of the Sierra Club and the Galveston League of Women Voters. One Sierra Club member criticizes the failure of the City Planning Commission to have a guiding philosophy to follow in preparing a zoning plan for West Island. Consequently, developers and environmentalists are battling over how the land will be used. The Galveston Sierra Club is also concerned with the effect, or lack of effect, of the proposed State Coastal Management

Program. This concern is valid, because the Natural Resources Council (NRC) which administers the program and is a statutory-based council composed of policy-making members from the boards or commissions of relevant state agencies is given no regulatory authority. The separate state agencies and other affected entities would still be free to ignore the recommendations of the NRC. The Galveston League of Women Voters is particularly concerned with the erosion of sand dunes on Galveston Island and the pollution of West Bay. They strongly support inclusion of erosion rates and hurricane warnings in the coastal property deeds and the provision of large-scale coastal hazards maps to new owners and buyers (Texas Coastal Management Program, August 1976).

The public sectors - It would be very difficult for any permanent resident of Galveston Island not to know that there is a possibility of a hurricane striking the Island. Media coverage (radio, television and newspapers) of hurricane seminars held both on Galveston Island and up and down the entire Texas coast is thorough and constant, both before and during hurricane season.* However, the public's conception of a hurricane is yet another story. Many people on Galveston Island have never experienced a real hurricane. Carla struck the Island in 1961, and fierce as she seemed, the eye of the storm actually struck 70 or 80 miles west of Galveston. Fringe experiences of storms often lead to false conclusions and a false complacency about hurricanes. This attitude has spread over much of Galveston Island. Representatives of the Galveston Corps of Engineers, who are also residents of the city, feel that a lot

*The Texas Hurricane Awareness Program has been in existence for the last five years, providing hurricane survival checklists and flooding maps for eight areas of the Texas Coast, including Galveston.

of misunderstanding exists on the Island as to how severe the effects of a hurricane can be (Hamblen III, 1975). In addition, people's memories do not last long, and it is felt that even those who remained on Galveston during Carla would probably stay there again (Tanner, 1975). According to Davis Benton (1975) of the Galveston National Weather Service, there is less attendance at hurricane conferences as the time from the last severe storm (Carla) grows longer. He feels that apathy is definitely the worst enemy of Galveston residents.

Compounding the feeling of complacency on the Island is the existence of a false sense of security created by the Galveston Seawall. To most citizens the seawall is the "end-all" in hurricane protection, and this feeling increases apathy to other adjustment choices to the hurricane flood hazard. Further, many people erroneously think that if they purchase an expensive coastal home, the price tag means that it is hurricane-proof (Brazosport Facts, 1975).

However, some long-time property owners on West Island, which is not protected by the seawall, are very much aware of their susceptibility to hurricanes. One such owner, residing on Eckert's Bayou, was very upset by the fact that a developer was going to dredge out land on the bayou. As she put it, "the highest point on Galveston Island would be dredged and we need all the hurricane protection we can get" (Texas Coastal Management Program, September 1976, p. 41). Texas Parks and Wildlife, which issues the permit to the developer, stated that there was nothing they could do for the existing property owners. Still another long-time resident of Galveston, a lawyer living on West Island, deplores the lack of an advocate for the private citizens against the powerful monied interests. He insists that older

families on the Island cannot be fooled with slick words and talk of trade-offs in order to justify degradation of the environment and the resultant susceptibility to hurricanes.

Thus, overall, awareness of the existence of the hurricane hazard on Galveston Island seems to be fairly high, certainly the highest of anywhere on the Texas coast. Most respondents think that citizen awareness has increased significantly since the instigation of the Flood Insurance Program (approximately 6,000 Galveston Island policies written, National Flood Insurance Program, July 1977), although some estimates place the percentage of adequately informed citizens as low as 20%. On the other hand, there appears to be evidence of what Harry Moore (1964) defines as a "disaster culture" on Galveston Island. Moore defines disaster culture as including "those adjustments, actual and potential, social, psychological and physical, which are used by residents of areas exposed to frequent storms to cope with disasters which have struck or which tradition indicates may strike in the future" (Moore, 1964, p. 195). These defenses can include many things from folk tales of storms to construction of seawalls. However, at the core of it all is an attitude of defiance, and a pride in the ability to withstand anything the storm can put forth. This attitude seems to be particularly endemic to BOI's. Refusal to evacuate before a hurricane is a typical reaction of many Galveston Islanders. After Carla, a Galveston professional man said that he was "very proud of not having evacuated". His parents had never fled before a storm and neither had he (Moore, 1964, p. 199). About 40,000 people (70-80%) stayed on the Island during Carla even though most knew that they would eventually be cut off from the mainland.

Another basic concept of the disaster culture is the tendency to deny or minimize the danger faced or the loss incurred. Discussions with Galveston residents for this study brought forth many comments illustrating this tendency. Also at the center of the disaster culture is a feeling of community growing out of common experiences shared by the participants, but not the society as a whole. One civil leader from an old Galveston family expressed the feeling well when she stated that "living on a potential disaster spot has tended to develop in its citizens a philosophy which is at the same time nonchalant, imperturbable, stoic, and with, above all, a sort of paternalistic pride in the blows that nature can give and thirty miles of sandbar can take" (Moore, 1964, p. 205). She goes on to say that it would never occur to her family, or thousands like them, to run away from a storm, and further, that it would be political suicide for an elected municipal official to leave the Island during the storm. One Galveston city official (a relative "newcomer" to the Island of nine years) bears out the above statements, saying that his BOI friends often boast of having had beach parties during Carla. He goes on to say that a definite defiance of storms and a reluctance to evacuate or show fear, are all characteristics of many on the Island (Nadon, 1976).

In conclusion, then, it does appear that a continuing "disaster culture" of sorts has evolved on Galveston Island and perhaps in other locations on the Texas coast as well. Failure to recognize or acknowledge the existence of such a culture could result in the collapse of a supposedly comprehensive adjustment program to the hurricane flood hazard. The careful study of the disaster culture could help to define and determine the likely actions of people and institutions before and during a disaster. Only with this knowledge can

a truly effective program of adjustments to the coastal flood hazard be formulated for Galveston and possibly other locations. It is essential that all social and psychological aspects of the hurricane hazard be considered by disaster preparedness officials as they formulate their program.

RESPONSE TO HURRICANE ANITA

On September 2, 1977, Hurricane Anita lashed the sparsely populated Mexican coastal communities of LaPesca and Soto la Marina, located about 135 miles south of Brownsville, Texas. Anita, with winds up to 150 mph, had threatened most of the lower Texas coast before heading southwest for Mexico.

A post-Hurricane Anita telephone survey was conducted six weeks after the storm to determine the response to Anita of the Texas coastal residents in three high-hazard areas, as well as whether this near-miss hurricane affected their future preparedness plans. The three communities surveyed included Port Aransas, Port Isabel and South Padre Island. A summary of the conclusions made from the Post-Anita Survey is provided in Table 2.

Background

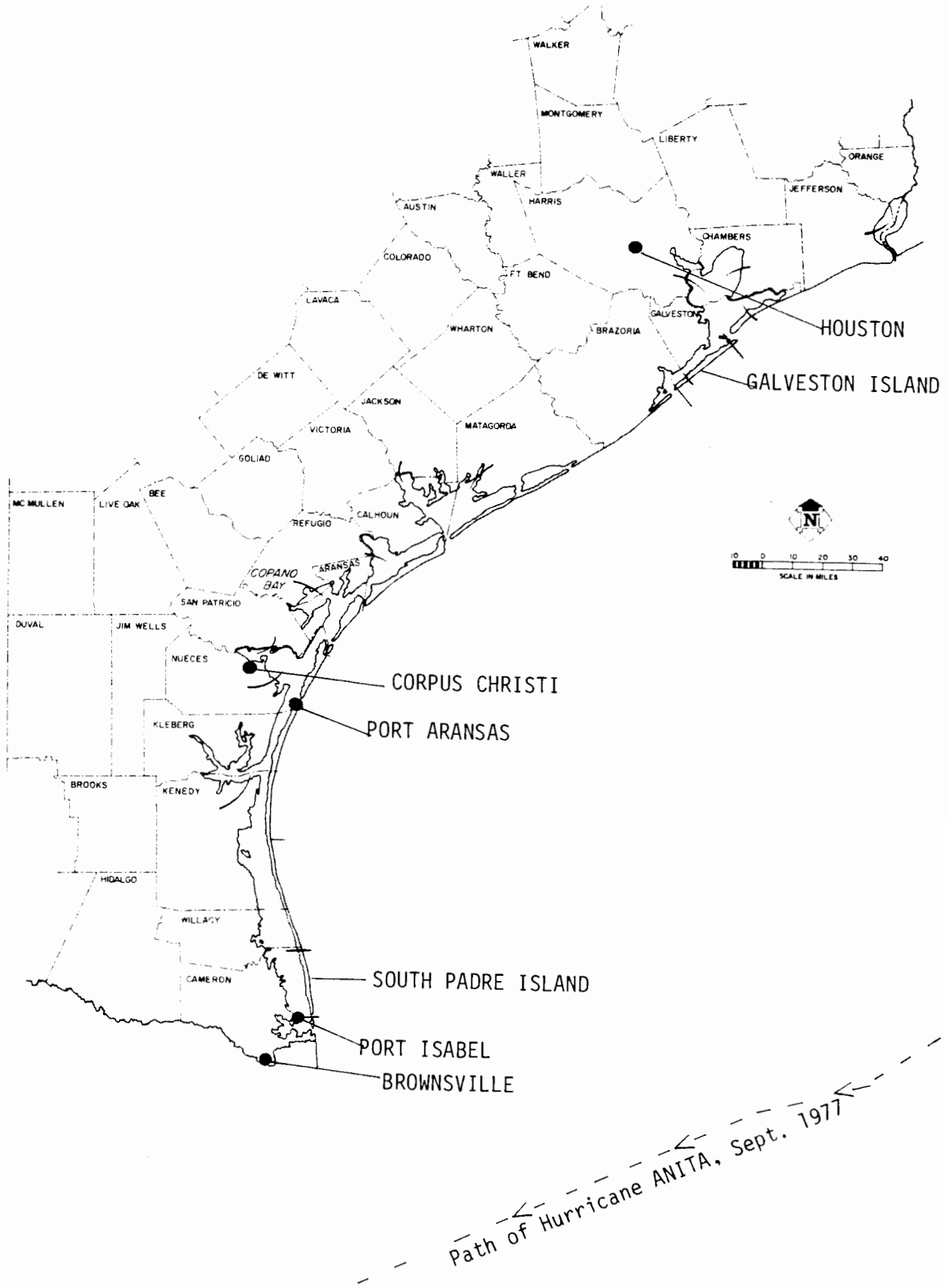
Port Aransas is a small community located on the barrier island of Mustang. Mustang and the adjacent North Padre Island front the coastal city of Corpus Christi (Figure 2). The Island economy centers on fishing and the tourist trade. Fifteen to 30 foot high sand dunes, which are still intact for the most part, provide some buffer to hurricane surge flooding. Development pressure on the Island is increasing rapidly. Access to Mustang is by ferry, which ceases running when winds reach 40 knots, or tides reach five to six feet; or by the JFK Causeway, which connects the adjacent North Padre

TABLE 2

POST-ANITA SURVEY CONCLUSIONS

- Almost all residents evacuated from Port Aransas, Port Isabel, and South Padre.
- Almost all these same residents would evacuate prior to the next storm.
- There is a high level of awareness concerning hurricanes and the preparations required prior to the storm's arrival. Residents were well prepared before Anita and would make the same preparations before the next storm.
- Some further preparedness/weather information is desired prior to the next hurricane.
- Almost 3/4 of the respondents had some hurricane survival checklists, but we cannot be sure from what source these checklists came. (Some were definitely familiar with the Texas Hurricane Awareness Program.)
- The performance of the NWS in predicting and forecasting hurricane movement was praised.
- Satisfaction was expressed with local preparedness officials and plans.
- More information on evacuation routes was desired by respondents.
- Insurance coverage seems to be fair in these high-hazard areas (53% have both flood and wind insurance), but some dissatisfaction was expressed as to expense. Some said they could not afford it.
- People do perceive, for the most part, that they live in an extremely vulnerable, high-hazard area, but they seem willing to accept this risk, either because it's worth it, or because they have no other choice.
- Some doubts exist as to whether residents really know how bad a hurricane can be although those who went through Celia and Beulah definitely have a healthy respect for them.
- Some difference among the three communities' responses could be delineated. Their perceptions of which would cause the greater damage, wind or water, is one of the areas of notable difference. Knowledge of the existence of a formal community plan for hurricanes also varied significantly among communities.

LOCATION MAP OF POST-ANITA SURVEY COMMUNITIES



Island with Corpus Christi, and closes when tides reach four to five feet above mean sea level. Celia (1970), the last major hurricane to strike this area, had winds of over 130 mph (gusting to 180 mph) with tides exceeding nine feet above mean sea level. The 1919 storm had 120 mph winds and 16 foot tides (Brown et al. 1974).

Port Isabel is located on the mainland in far South Texas immediately northeast of Brownsville, fronting Laguna Madre. Commercial fishing and the tourist industry provide most of the economy of this community. Housing, which fronts the beach, is mostly of the one-story, wooden or mobile home variety, and elevation is very low. Only two roads lead out of the community--Highway 48 to Brownsville, and Highway 100 to Los Fresnos, both of which flood out in places when tides reach five to six feet above mean sea level.

South Padre Island is located immediately east of Port Isabel with the City of South Padre itself situated on the westernmost tip of the Island. This city is still very much a seasonal (summer), tourist-oriented community, and new development is occurring with no constraints. Several high-rise condominiums have been constructed on the Island, some of which are built in a hurricane washover channel cut by Hurricane Beulah in 1967 prior to their construction. South Padre has only one escape route, the Queen Isabella Causeway, which is cut off from the mainland when tides reach five to six feet above mean sea level. The last major hurricane striking the lower Texas coast, and affecting both Port Isabel and South Padre, Beulah in 1967, had tides up to 12 feet above mean sea level and winds of 125-160 mph. Rainfall was in excess of 30 inches during the four or five days following the storm (Brown et al.).

Watch and Warning

A hurricane watch for Anita was issued for the entire Texas coast at 5:45 p.m. CDT on August 30. Then, at 5:30 a.m. CDT on September 1, a hurricane warning was issued from Brownsville to Corpus Christi (Figure 2). By 5:30 p.m. CDT, evacuation of Port Isabel and South Padre Island was completed, and traffic into these cities had been stopped. Tides at times reached three and one-half feet above mean sea level and exit roads were awash although not completely closed. Tides ultimately reached about four feet above mean sea level.

A hurricane watch and gale warnings continued to be in effect for the Port Aransas area until after Anita had made landfall in Mexico. Although it was not headed in this direction, residents were warned by the National Weather Service to be prepared for evacuation should it become necessary, and finally were advised to leave the Island at 9:40 p.m. CDT, September 1. At this time, the Mustang Island highway from Port Aransas to Padre Island and the causeway to the mainland were closed, and the high tides of four feet above normal were creating marginal conditions for the operation of the ferries from Port Aransas to Aransas Pass on the mainland.

Methodology

In conducting the Post-Anita Study, a random 5% household sample, selected from local phone directories, was surveyed by telephone in each of three communities: Port Aransas (45 persons), Port Isabel (36 persons), South Padre (38 persons) for a total of 107 respondents. Communities were selected for both their vulnerability to hurricane damage and/or their proximity to Anita's path.

A formal questionnaire was developed by adapting a format used in another on-going hazard research project.* Since time was important, it was felt that this was the most efficient way of formulating a good questionnaire.

Information gathered during the survey was recorded on questionnaire answer sheets. Names and telephone numbers were noted with their respective responses, leaving open the possibility of a follow-up study during the 1978 hurricane season.

Survey results were analyzed in terms of the proportional (percentage) representation of each answer. Differences among responses in each community were compared in addition to the examination of individual responses. A chi-square contingency table test was applied to further determine if significant differences existed among the three communities' responses to each question. A cluster analysis was also done in an attempt to discover any relationships among the responses to different questions.

Results

The general level of preparedness was found to be high in all three communities surveyed, and most residents indicated that they would make the same preparations, including evacuation, the next time a hurricane threatened their community. Overall, statistically significant differences between areas were slight, with major exceptions noted below. No obvious relationships among various responses to different questions were discerned. Quantitative survey results are presented in the Appendix. The following comments provide a synopsis by topic of the information obtained through the Post-Anita Survey.

*Community Response to Natural Hazard Warnings, Natural Hazard Warning Systems, University of Minnesota, Minneapolis, Minnesota.

First awareness of storm. Almost everyone claimed to be aware of the storm on Monday, August 29, when Anita formed as a tropical depression. Memories were "foggy" since it had been six weeks from Anita's arrival, but the general feeling was that people were extremely alert at all times during hurricane season to the possibility of a storm.

Information sources. Television was most heavily relied upon as an information source during the warning period (approximately 60%) with radio being the second choice. Other means such as NOAA weather radio and communication from friends played very little part in the dissemination of information about the storm.

Perception of Anita. Most people (approximately 80%) definitely perceived a direct threat from Anita and believed at some point that it could or would strike their community. No difference in threat perception among the three communities could be discerned. When respondents were asked to rate Anita on a scale of severity from one to five (weak to strong) according to how it affected them, no clear pattern could be discerned from their answers. Respondents knew from media sources that Anita was a "bad" hurricane and, in some cases, they did not separate this piece of information from the fact that Anita had actually affected them very little - so an equal number gave the storm a "one" rating as gave it a "five" rating. The remaining respondents spread their answers fairly among a "two", "three", and "four" rating for the storm.

Preparation for Anita. Only two people out of the 107 interviewed said that they did nothing to prepare for the possibility of Anita's arrival, and one of these was not in his community until late in the warning period. This person indicated that he would prepare for the next storm completely. The other person would make only minimal preparations next time.

Residents in all communities almost without fail collected flashlights, candles, tied down loose objects in yards, and had transistor radios. Fewer, but still most, boarded up windows and collected a supply of food and water.

Evacuation/relocation was almost total with 95 out of 107 interviewed relocating either to another town, higher ground, or to a shelter. Most of these left their communities entirely, with only five going to CD or Red Cross Shelters. The remainder stayed with friends in other towns or in motels.

Storm prediction. Only about 70% of the people interviewed remembered hearing official predictions about where Anita would strike, which is surprising considering the level of awareness and preparation for the storm. Those who did list predicted strike locations for Anita were generally very accurate in their perception of the storm movement. Brownsville and Mexico were most often listed as strike points, which is logical since these were the last locations predicted by the National Weather Service for Anita's landfall.

Residents were generally very pleased with the performance of the National Weather Service in monitoring and predicting the progress of Anita and other hurricanes as well. Most felt that the accuracy of NWS in predicting landfall of hurricanes was quite good. Approximately 90% of respondents gave the NWS a 50% or greater accuracy rating with 75% being the most frequently assigned rating (21% of respondents).

Effect of Anita on future hurricane preparations. Of those who did not evacuate prior to Anita (11), about half said they would evacuate next time, and half said they would not.

Sixty-six percent of the respondents indicated that they were more likely to evacuate next time as a result of their experiences with Anita and

many said they would always evacuate in any case. Only a few (8%) indicated they were less likely to evacuate after Anita, and still fewer commented that they would never evacuate because of responsibilities or other reasons.

Most residents indicated that they would make about the same preparations for the next storm as they did for Anita, with 63% saying that they would try to get more information prior to the next storm.

Hurricane awareness information distribution. Seventy percent of the respondents had seen or heard of a set of hurricane safety rules/survival checklists within the last six months. The newspaper was the most frequently mentioned source for the checklist (36%) with radio and TV second (19%), and home and public buildings tying for third (10% each). Only a few mentioned obtaining a checklist at work.

Hurricane experience. About 75% of the respondents claimed to have previously been in an area when a hurricane hit. Approximately half of these had experienced only one hurricane while another 40% had been in two to five hurricanes.

Eighty-nine out of the total 107 sampled had been in areas where hurricanes had been expected but did not hit.

Effectiveness of community preparedness plans. Most respondents both knew of community preparedness plans (77%) and felt that they were practical (69%). However, a significant (.05) difference among communities was found with respect to knowledge of the existence of a community plan in case of a hurricane warning. It appears that the residents of Port Isabel were less likely to be aware of their specific community plan than the other two locations. No apparent reason could be defined for this lack of knowledge, nor

did it seem to significantly affect preparedness measures taken in Port Isabel.

Being prepared to evacuate was most often mentioned as the action required of the individual under his community plan.

Generally, people were very satisfied with their local officials' performance and handling of activities during the hurricane watch and warning period. A few respondents in Port Aransas indicated that they felt that some local officials had over-reacted to Anita.

Worries connected with evacuation. Respondents worried most about leaving their property behind when evacuating (43%). However, this worry included not only fear of storm damage, but fear of looting as well. Other worries included traffic problems, ferry ceasing to run, not being able to get back into the community, safety of family, and the cost of staying somewhere else.

As might be expected, fear of being killed or injured was the main worry about staying during a hurricane (73%). Other worries included damage to property, running out of food and other supplies, and snakes.

Perception of hurricane effects on property. When asked to rate the effect which an average hurricane would have on their property (little, serious, very serious effect), 46% said it would have a very serious effect on their property, 28% said serious effect, and 16% said little effect (10% miscellaneous).

There was little agreement as to whether wind or water would pose the biggest threat to the respondents' housing units, with 38% seeing water as more threatening, 34% seeing wind as potentially more damaging, and 19% seeing both as equally threatening. However, statistically significant

differences among the three communities' perception can be found. Residents in Port Aransas felt that wind could cause the most destruction, while the two communities on the lower coast indicated that water was the largest threat.

Housing. Wood is the most popular construction material for all homes in the three communities surveyed (42%), followed by brick (26%). (Port Isabel had about a fifty-fifty split between wooden and brick structures.) Mobile homes, however, comprised 13% of the homes surveyed as compared to 4.6% of the housing for Texas as a whole.

Most of the homes surveyed were not elevated on pilings (59%). Homes elevated on pilings account for 31% of the total. Some other homes are elevated on concrete blocks only, or have the first story used for a garage.

Most homes surveyed were owned (66%) rather than rented (29%) by their occupants. However, residents of South Padre differed significantly from those in the other two locations by having more residents renting than owning their housing units.

Insurance. Seventy-one percent of the respondents had some type of insurance on their property. Of these, 53% had both wind and flood insurance and 46% had from 75-100% of their property covered. Another point to note is that almost a fifth of the respondents did not know how much coverage they had. Furthermore, it is suspected by the tentativeness of some responses that many were not sure of their coverage in respect to wind and flood insurance.

Recommendations for Future Research and Actions

Though the level of preparedness was high, as evidenced by the Post-Anita Survey, preparedness officials should not relax their efforts to insure that wise actions are taken prior to a hurricane. In fact, the survey brought

out several points which can be interpreted as calls to action, or, at least, needs for further research:

- Many respondents said they would like further information, including more frequent storm movement data. However, some preliminary findings from a current research effort* show that more frequent bulletins result in people delaying their response, with the consequence that there is less likelihood of responding in time. This particular portion of the research centered on tornadoes. Further investigation needs to be done to determine if the same effect could be true of response to hurricane warnings.**
- Emphasis was placed by respondents on the need for more detailed information on evacuation routes, not only within and immediately adjacent to the community, but for many miles from the starting point. Knowledge of the existence of a formal community plan, and the individual actions for which it called, appeared somewhat irregular. More local public information efforts would be helpful in educating the general public in regard to the city or county emergency preparedness plan.
- Many residents were unsure of their insurance coverage--how much and what elements were covered. Local insurance agents should provide clearly written information (not just policy copies) on exactly what coverage each individual has. Perhaps

*Community Response to Natural Hazard Warnings, Natural Hazard Warning Systems, University of Minnesota, Minneapolis, Minnesota.

**Some effort in this area is being made through a current Hurricane Response Model Study being conducted by the Industrial Economics Research Division, Texas A&M University, College Station, Texas.

a prepared checklist could be handed out with each policy, with the items and amount of protection noted.

- Continued hurricane awareness efforts in distinguishing between the effects of fringe experiences and actual direct hurricane hits seemed to be called for by respondents. Many residents in the Post-Anita Survey had trouble distinguishing between the fact they had heard Anita was a severe storm, and the fact that it actually had only slight effects on them and their property. Although this result could have been influenced by the phrasing of the question, future response studies should address the possible confusion of storm severity by residents in a near-miss hurricane.

RELATIONSHIP BETWEEN GALVESTON AND POST-ANITA STUDIES

The two studies cannot be directly compared since they were conducted in different manners and time frames--one immediately following a near-miss hurricane, and the other (Galveston) 15 years after the last major hurricane. However, using data collected after Hurricane Carla (Moore, 1963 and 1964), plus the newer Galveston study, a few observations can be made on the relationship between the two situations.

It appears that the Galveston Island residents are much less likely to evacuate prior to a hurricane than those in the equally vulnerable lower Texas coast locations (Port Aransas, South Padre, and Port Isabel). Prior to Hurricane Carla, only 20-30% of Galveston Island residents actually evacuated to the mainland and almost 30% remained in their homes with the remainder going to Island shelters and other buildings. In contrast, the Post-Anita

Survey indicated that 84% of the residents left their south Texas communities prior to Anita.

Local newspaper articles after Anita indicated that residents of both the Port Aransas and South Padre/Port Isabel areas had learned some preparedness lessons from Hurricane Celia (1970) and Beulah (1967) respectively.* However, despite the fact that Hurricane Carla was a severe storm and caused much damage on Galveston Island, there is still a large number of persons on the Island who are determined not to evacuate, and who believe that the seawall will protect them from anything a hurricane can put forth.

Several reasons can be offered for this difference in attitude between Galveston and the communities sampled in the Post-Anita Survey:

1. The presence of a "disaster culture" on Galveston [as noted first by Harry Moore (1963, 1964) and somewhat reconfirmed in this latest research].
2. The presence of a large seawall on Galveston and not in the other locations which contributes to the tendency to defy the storm and to have a feeling of false security.
3. The length of the settlement on Galveston Island (since the early to mid-1800's) as compared to the settlement of Port Aransas and South Padre within the last 50 years or so. Some substantiation to this theory correlating length of residence with likelihood of evacuation was noted in the study done after

*"The people were prepared a lot better this time than for Beulah", said a Brownsville city official (Corpus Christi Caller - Times, 9/2/77).

The speed and energy with which people went about preparing for Anita shows that Corpus Christi learned the lesson of Celia well" (Corpus Christi Caller - Times, 9/5/77).

Hurricane Eloise (Windham, et al. 1977). It was found in the Eloise study that new residents were more likely to evacuate than long-time residents, and that after these newer residents had lived in the community for a few years, the attitude of the long-time residents was likely to influence them not to evacuate. Since dwellers in both Port Aransas and South Padre are still much more seasonal than on Galveston Island, this hypothesis might hold true for these Texas communities as well.

Ultimately, more research will have to be conducted for any of these hypotheses to be finally confirmed. Two human response research projects are being conducted on the Texas coast which might provide the answers to some of these questions.*

*Community Response to Natural Hazard Warnings. Natural Hazards Warning Systems, University of Minnesota, Minneapolis, Minnesota, and Hurricane Response Model. Carlton Ruch, Industrial Economics Research Division, Texas A&M University, College Station, Texas.

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APPENDIX
ANITA SURVEY

Frequency and Significance of Response Among Communities

- * = Significant difference to .05 level among the three communities.
** = Significant difference to .01 level among the three communities.

	<u>Port Aransas</u>	<u>South Padre</u>	<u>Port Isabel</u>	<u>total</u>	<u>%</u>
1. <u>WERE YOU HOME (IN YOUR COMMUNITY) DURING THE TIME WHEN HURRICANE ANITA WAS IN THE GULF?</u>					
No	8	7	2	17	14
Yes	45	28	34	107	86
2. <u>WHEN DID YOU FIRST BECOME AWARE OF THIS STORM? (ANITA)</u>					
Monday: before noon	16	11	9	36	34
Monday: noon-6:00 p.m.	23	12	19	54	49
Monday: after 6:00 p.m.	1	2	0	3	3
Tuesday: before noon	0	2	3	5	5
Tuesday: noon-6:30 p.m.	2	0	1	3	3
Tuesday: after 6:00 p.m.	0	0	0	0	0
Wednesday: before noon	0	1	0	1	1
Wednesday: noon-6:00 p.m.	0	0	1	1	1
Wednesday: after 6:00 p.m.	1	0	1	2	2
Don't know/don't remember	2	0	0	2	2
Missing/Inappropriate	0	0	0	0	0
3. <u>DURING THE PERIOD WHEN THE HURRICANE WATCH WAS IN EFFECT, WHAT SINGLE INFORMATION SOURCE DID YOU RELY ON MOST HEAVILY?</u>					
Television	26	16	24	66	62
Radio	10	9	6	25	23
NOAA Weather Radio (National Weather Service FM)	5	2	1	8	7
Newspapers	0	0	0	0	0
Civil defense or police	0	0	0	0	0
Relatives	0	0	1	1	1
Neighbors	0	0	0	0	0
Friends who are not neighbors	0	0	0	0	0
Other, specify	4	1	2	7	7
Missing/Inappropriate	0	0	0	0	0
Don't know	0	0	0	0	0

	<u>Port Aransas</u>	<u>South Padre</u>	<u>Port Isabel</u>	<u>Total</u>	<u>%</u>
4. DURING THE DAYS THAT ANITA WAS IN THE GULF, DID YOU PERSONALLY FEEL THAT THIS HURRICANE WAS A THREAT TO YOUR COMMUNITY -- THAT IT MIGHT HIT THE COAST NEAR YOU?					
No, did not perceive a threat	4	3	2	9	8
Yes, definitely perceived a threat	34	23	29	86	81
Uncertain	6	1	3	10	9
Missing/Inappropriate	1	1	0	2	2

5. DID YOU OR ANYONE IN YOUR IMMEDIATE FAMILY DO ANYTHING TO PREPARE FOR THE POSSIBILITY THAT ANITA MIGHT HIT YOUR PART OF THE TEXAS COAST?

No	1	1	0	2	2
Yes	44	27	34	105	98

IF ANSWER IS YES, DID YOU DO ANY OF THE FOLLOWING:

	<u>M/I</u>	<u>Y</u>	<u>N</u>	<u>Y</u>	<u>N</u>	<u>Y</u>	<u>N</u>	<u>Y</u>	<u>N</u>	<u>M/I</u>	<u>%</u>	
											<u>Y</u>	<u>N</u>
Collect supply of food & water		27	17	19	8	29	5	75	30		71	29
Obtain or collect flashlights, candles, lamps, batteries, matches, etc.		38	6	24	3	32	2	94	11		90	10
Obtain or check transistor radio		38	6	25	2	28	6	91	14		87	13
Board up windows		31	13	23	4	29	5	83	22		79	21
Tie down loose objects		39	5	24	3	30	4	93	12		89	11
Relocate to shelter (C.D. or Red Cross)		2	42	2	25	1	33	5	100		5	95
Relocate to other town or higher ground	1	38	5	25	2	32	2	95	9	1	91	9
Don't remember/don't know		0	0	0	0	0	0	0	0		0	0

	<u>Port Aransas</u>	<u>South Padre</u>	<u>Port Isabel</u>	<u>Total</u>	<u>%</u>
6. <u>DID YOU HEAR ANY OFFICIAL PREDICTIONS ABOUT WHERE HURRICANE ANITA WOULD HIT LAND WHILE THE HURRICANE WATCH WAS STILL IN EFFECT FOR YOUR AREA?</u>					
No	10	7	11	28	26
Yes	35	21	21	77	72
Missing/Inappropriate	0	0	1	1	1
Don't know	0	0	1	1	1

*7. <u>DO YOU REMEMBER WHAT THE PREDICTION WAS -- FOR WHAT CITY OR LOCATION?</u>					
Corpus Christi	5	4	4	13	12
Brownsville	18	7	7	32	28
Mexico	11	7	11	29	26
Louisiana	2	2	2	6	5
Galveston	1	3	1	5	4
Port Aransas	8	0	1	9	8
Port Isable	0	2	9	11	10
Port Mansfield	0	0	0	0	0
South Padre	0	5	2	7	6
Other	1	0	0	1	1
Missing/Inappropriate	0	0	0	0	0

	<u>Port Aransas</u>	<u>South Padre</u>	<u>Port Isabel</u>	<u>Total</u>	<u>%</u>
8. THIS QUESTION HAS TO DO WITH YOUR FEELINGS ON THE ACCURACY OF THE NATIONAL WEATHER SERVICE IN PREDICTING WHERE A HURRICANE WILL HIT LAND: OUT OF 100 HURRICANES PREDICTED BY THE NWS IN HOW MANY OF THOSE CASES DO YOU THINK THE NWS WOULD CORRECTLY IDENTIFY THE LOCATION OF HURRICANE LANDFALL?					
Percentage:					
0	0	1	0	1	1
10	0	1	0	1	1
15	1	0	0	1	1
20	1	0	0	1	1
25	1	0	0	1	1
30	0	0	1	1	1
50	3	3	6	12	11
60	1	3	2	6	6
65	0	1	0	1	1
70	1	2	3	6	6
75	9	3	6	18	17
78	0	0	1	1	1
80	6	2	3	11	10
85	3	3	0	6	6
90	5	3	4	12	11
95	1	0	1	2	2
96	0	1	0	1	1
100	0	1	1	2	2
Missing/Inappropriate	13	4	6	23	21

	<u>Port Aransas</u>	<u>South Padre</u>	<u>Port Isabel</u>	<u>Total</u>	<u>%</u>
9. <u>IN TERMS OF HOW IT AFFECTED YOU, WOULD YOU RATE THE SEVERITY OF HURRICANE ANITA ON A SCALE OF 1, 2, 3, 4, 5, WITH ONE BEING A WEAK HURRICANE AND FIVE BEING A VERY SEVERE ONE?</u>					
One	13	4	6	23	22
Two	4	9	4	17	16
Three	10	6	5	21	20
Four	3	2	8	13	12
Five	9	7	8	24	22
Missing/Inappropriate	0	0	0	0	0
Don't know	6	0	3	9	8
10. <u>IF YOU DID NOT EVACUATE PRIOR TO ANITA, WOULD YOU HAVE EVACUATED HAD THE STORM BEEN PREDICTED TO HIT THE COAST NEAR YOUR HOME?</u>					
No	3	1	1	5	28
Yes	3	2	1	6	33
Missing/Inappropriate	2	0	5	7	39
Don't know	0	0	0	0	0
11. <u>AS A RESULT OF YOUR EXPERIENCES WITH HURRICANE ANITA, ARE YOU MORE LIKELY OR LESS LIKELY TO EVACUATE?</u>					
More likely to evacuate	23	21	27	71	66
Less likely to evacuate	6	1	2	9	8
Other, specify	11	4	4	19	18
Missing/Inappropriate	4	2	1	7	7
Don't know	1	0	0	1	1

**12. AS A RESULT OF YOUR EXPERIENCE WITH HURRICANE ANITA, WOULD YOU DO ANYTHING SPECIFIC TO PREPARE FOR THE NEXT HURRICANE THREAT?

	Port Aransas			South Padre			Port Isabel			Total			%				
	M/I	Y	N	M	Y	N	M	Y	N	M	Y	N	M/I	Y	N	M/I	
If YES, would you do the following:																	
Try to get more information	1	38	6	0	18	10	0	34	0	0	90	16	0	1	84	15	1
Prepare house and other possessions for storm	24	19	1	23	4	1	20	14	0	67	37	2		63	35	2	
Collect supply of food and water	40	4	0	26	1	1	33	1	0	99	6	1		93	6	1	
Obtain or collect flash-lights, candles, matches, etc.	38	6	0	26	1	1	31	3	0	95	10	1		90	9	1	
Evacuate to Civil Defense or Red Cross shelter	40	4	0	27	0	1	34	0	0	101	4	1		95	4	1	
Evacuate to higher ground, another city, etc.	6	37	1	3	25	0	4	30	0	13	92	1		12	87	1	
	38	5	1	26	1	1	32	1	1	96	7	3		90	7	3	

	<u>Port Aransas</u>	<u>South Padre</u>	<u>Port Isabel</u>	<u>Total</u>	<u>%</u>
13. <u>IN THE LAST SIX MONTHS, HAVE YOU HEARD OR SEEN A SET OF HURRICANE SAFETY RULES OR A HURRICANE SURVIVAL CHECKLIST?</u>					
No	13	7	10	30	28
Yes	30	21	24	75	70
Missing/Inappropriate	1	0	0	1	1
Don't know	1	0	0	1	1
14. <u>WHERE DID YOU HEAR ABOUT OR SEE THESE?</u>					
At home	4	2	2	8	11
At work	0	1	3	4	5
In someone else's home	0	0	0	0	0
In a public building (not at work)	4	4	0	8	11
In the paper	9	12	6	27	36
On the radio or TV	5	1	8	14	19
Other, specify	4	0	2	6	8
Missing/Inappropriate	3	0	1	4	5
Don't know	1	1	2	4	5
15. <u>HAD YOU EVER BEEN IN AN AREA AT THE TIME WHEN A HURRICANE HIT?</u>					
No	11	7	8	26	24
Yes	33	21	26	80	75
Missing/Inappropriate	1	0	0	1	1
Don't know	0	0	0	0	0

	<u>Port Aransas</u>	<u>South Padre</u>	<u>Port Isabel</u>	<u>Total</u>	<u>%</u>
16. <u>HOW MANY TIMES HAVE YOU BEEN IN AN AREA THAT WAS HIT BY A HURRICANE?</u>					
# of Times:					
1	11	13	16	40	51
2	4	3	2	9	11
3	9	3	4	16	20
4	2	1	0	3	4
5	4	0	2	6	8
6	0	0	1	1	1
7	1	0	0	1	1
8	1	0	0	1	1
15	0	1	0	1	1
Missing/Inappropriate	0	1	0	1	1
Don't know	0	1	0	1	1
17. <u>HOW MANY TIMES HAVE YOU BEEN IN AN AREA WHERE A HURRICANE WAS EXPECTED TO HIT BUT DIDN'T?</u>					
# of Times:					
0	3	1	0	4	4
1	5	1	3	9	3
2	2	4	4	10	9
3	3	6	3	12	11
4	6	6	6	18	15
5	2	1	4	7	6
6	6	1	4	11	10
7	0	1	2	3	3
8	0	1	3	4	4
9	0	1	1	2	2
10	2	1	1	4	4
11	0	1	0	1	1
15	0	0	1	1	1
20	0	1	1	2	2
30	1	0	0	1	1
Missing/Inappropriate	6	0	0	6	5
Don't know	11	2	2	15	14

	<u>Port Aransas</u>	<u>South Padre</u>	<u>Port Isabel</u>	<u>Total</u>	<u>%</u>
*18. <u>DO YOU KNOW IF THERE IS A COMMUNITY-WIDE PLAN FOR WHAT PEOPLE SHOULD DO IN CASE OF A HURRICANE WARNING?</u>					
No	2	3	11	16	15
Yes	39	24	20	83	77
Missing/Inappropriate	1	0	1	2	2
Don't know	3	1	2	6	6
19. <u>DO YOU THINK THAT PLAN IS PRACTICAL?</u>					
No	3	1	0	4	5
Yes	33	21	20	74	88
Missing/Inappropriate	0	1	0	1	1
Don't know	3	2	0	5	6
20. <u>WAS THE PLAN ACTIVATED PRIOR TO HURRICANE ANITA?</u>					
No	0	0	1	1	1
Yes	32	22	19	73	87
Missing/Inappropriate	0	1	0	1	1
Don't know	7	2	0	9	11
*21. <u>WHAT DOES THE COMMUNITY-WIDE PLAN REQUIRE YOU TO DO?</u>					
Protect my home	7	6	5	18	21
Be prepared to evacuate my home	19	12	5	36	43
Help in preparing the community in some way	5	4	5	14	17
Other, specify	1	0	5	6	7
Missing/Inappropriate	1	1	0	2	2
Don't know	6	2	0	8	10

	<u>Port Aransas</u>	<u>South Padre</u>	<u>Port Isabel</u>	<u>Total</u>	<u>%</u>
22. <u>WHAT WORRIES YOU MOST ABOUT EVACUATING BEFORE A HURRICANE?</u>					
Leaving your property behind	19	13	13	45	41
The cost of staying somewhere else	1	1	2	4	4
No knowing what will happen where you go	0	2	2	4	4
Finding out that it was not necessary after all	1	0	0	1	1
Other, specify	15	10	11	36	34
Missing/Inappropriate	4	1	0	5	5
Don't know	5	1	6	12	11
23. <u>WHAT WORRIES YOU MOST ABOUT STAYING DURING A HURRICANE?</u>					
Afraid of being killed or injured	26	21	20	67	63
Afraid you'd change your mind at the last moment and couldn't get out	1	0	0	1	1
Afraid that others would worry a lot	2	0	0	2	2
Might run out of food & supplies	0	1	1	2	2
Other, specify	7	4	5	16	15
Missing/Inappropriate	4	1	4	9	8
Don't know	5	1	4	10	9
24. <u>IN CASE A HURRICANE OF AVERAGE STRENGTH HIT THIS AREA, HOW BAD COULD IT BE ON YOUR PROPERTY? WOULD IT LIKELY HAVE:</u>					
Little effect	9	2	6	17	16
Serious effect	14	6	10	30	28
Very serious effect	18	17	14	49	45
Missing/Inappropriate	3	0	2	5	5
Don't know	1	3	2	6	6

	<u>Port Aransas</u>	<u>South Padre</u>	<u>Port Isabel</u>	<u>Total</u>	<u>%</u>
25. STRICTLY SPEAKING, THE CHANCES OF HURRICANES HITTING HERE ARE SO SLIM THAT IT DOESN'T MAKE MUCH SENSE TO DO A GREAT DEAL OF PLANNING FOR THEM. DO YOU AGREE OR DISAGREE?					
Agree	2	1	3	6	6
Disagree	40	26	28	94	87
Missing/Inappropriate	3	0	2	5	5
Don't know	0	1	1	2	2
26. CONCERNING THE CONSTRUCTION OF YOUR HOUSING UNIT, IS IT:					
Wood	21	11	14	46	43
Brick	7	6	15	28	26
Mobile	8	4	2	14	13
Other, specify	4	7	2	13	12
Missing/Inappropriate	5	0	1	6	6
Don't know	0	0	0	0	0

Elevated on pilings	18	12	7	37	35
Non-elevated	23	16	25	64	59
Other, specify	0	0	1	1	1
Missing/Inappropriate	4	0	1	5	5
Don't know	0	0	0	0	0

** Single story	28	16	30	74	69
Multi story	14	12	3	29	27
If <u>YES</u> how many?					
2 story	13	8	3	24	83
3 story	1	3	0	4	14
Unrecorded	0	1	0	1	3
Missing/Inappropriate	3	0	1	4	4
Don't know	0	0	0	0	0

	<u>Port Aransas</u>	<u>South Padre</u>	<u>Port Isabel</u>	<u>Total</u>	<u>% /10</u>
**27. <u>DO YOU OWN OR RENT YOUR HOUSING UNIT?</u>					
Own	35	8	28	71	66
Rent	7	19	5	31	29
Other, specify	1	0	0	1	1
Missing/Inappropriate	2	1	1	4	4
Don't know	0	0	0	0	0
*28. <u>WHICH WOULD POSE THE BIGGEST THREAT TO YOUR HOUSING UNIT: WIND OR WATER?</u>					
Wind	23	4	10	37	35
Water	12	14	15	41	37
Both equal	6	7	8	21	20
Missing/Inappropriate	3	0	1	4	4
Don't know	1	3	0	4	4
29. <u>WAS THERE ANY DAMAGE TO YOUR PROPERTY DUE TO HURRICANE ANITA?</u>					
None or slight	39	28	33	100	93
Moderate	2	0	0	2	2
Severe	1	0	0	1	1
Missing/Inappropriate	3	0	1	4	4
Don't know	0	0	0	0	0
30. <u>DO YOU HAVE INSURANCE ON YOUR PROPERTY?</u>					
No	7	8	7	22	21
Yes	31	19	26	76	70
Missing/Inappropriate	5	0	1	6	6
Don't know	2	1	0	3	3

	<u>Port Aransas</u>	<u>South Padre</u>	<u>Port Isabel</u>	<u>Total</u>	<u>%</u>
31. <u>IF YES, WHAT TYPE OF INSURANCE DO YOU HAVE?</u>					
Flood	4	3	0	7	9
Wind	1	1	3	5	6
Both of the above	24	14	19	57	71
Neither of above	1	0	0	1	1
Missing/Inappropriate	3	0	2	5	6
Don't know	1	1	4	6	7
32. <u>WHAT PERCENTAGE OF YOUR PROPERTY IS COVERED BY INSURANCE?</u>					
0-25	2	0	0	2	3
25-50	0	1	0	1	1
50-75	1	2	0	3	4
75-100	17	13	19	49	61
Missing/Inappropriate	4	1	0	5	6
Don't know	11	2	7	20	25
33. <u>AFTER HURRICANE ANITA, DID YOU FILE AN INSURANCE CLAIM?</u>					
No	25	19	26	70	89
Yes	3	0	0	3	4
Missing/Inappropriate	3	0	0	3	4
Don't know	0	0	0	0	0
If YES, for what type of damage?					
Flood damage	0	0	0	0	0
Wind damage	1	0	0	1	1
Other, specify	1	0	0	1	1
Unrecorded	1	0	0	1	1

	<u>Port Aransas</u>	<u>South Padre</u>	<u>Port Isabel</u>	<u>Total</u>	<u>%</u>
(34) <u>Age of Respondents</u>					
19 or Under	1	0	2	3	3
20-24	3	1	5	9	8
25-29	6	8	2	16	16
30-34	4	2	4	10	10
35-39	4	2	3	9	8
40-44	1	0	2	3	3
45-49	3	2	2	7	7
50-54	2	3	1	6	6
55-59	3	3	2	8	7
60-64	3	2	3	8	7
65-69	3	1	5	9	8
70-74	4	2	2	8	7
75-79	1	0	0	1	1
80-84	2	0	0	2	2
Missing	5	2	1	8	7
(35) <u>Marital Status of Respondents</u>					
Married	28	22	24	74	69
Single	6	2	4	12	11
Divorced	3	2	3	8	7
Widowed	5	1	1	7	7
Separated	0	0	0	0	0
Missing/Inappropriate	3	1	2	6	6
(36) <u>Occupation of Respondents</u>					
Fisherman/shrimper	1	3	1	5	5
Housewife	15	6	11	32	30
Retired	8	2	3	13	12
Laborer	7	0	6	13	12
Other	11	15	10	36	34
Missing/Inappropriate	3	2	3	8	8

	<u>Port Aransas</u>	<u>South Padre</u>	<u>Port Isabel</u>	<u>Total</u>	<u>%</u>
(37) <u>Occupation of Respondent's Spouse</u>					
Fisherman/shrimper	1	3	2	6	7
Housewife	3	5	5	13	15
Retired	6	2	5	13	15
Laborer	8	1	5	14	16
Other	13	12	8	33	36
Missing/Inappropriate	5	2	3	10	11
* (38) <u>Years of School</u>					
8 or less	3	2	6	11	10
9-11 (some high school)	1	4	8	13	12
High school graduate	15	4	10	29	27
Some college or training school	14	10	5	29	27
College graduate	6	3	2	11	10
More than college degree	3	4	0	7	7
Missing/Inappropriate	3	1	3	7	7
(39) <u>Gender of Respondents</u>					
Male	13	12	15	40	37
Female	31	16	19	66	62
Missing	1	0	0	1	1