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The University of New Orleans 2011 Hazard Mitigation Plan Update

UNO-CHART
University of New Orleans

The University of New Orleans

2011 Hazard Mitigation Plan Update

Submitted By

The Center for Hazards Assessment, Response and Technology (CHART)
at The University of New Orleans.[1]

October 2011

[1] CHART is an applied social sciences hazard research center housed in the Department of Sociology at The University of New Orleans.

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RESOLUTION ADOPTING A HAZARD MITIGATION PLAN UPDATE FOR THE UNIVERSITY OF NEW ORLEANS, NEW ORLEANS, LOUISIANA

WHEREAS, the Disaster Mitigation Act of 2000, as amended, requires the development and adoption of hazard mitigation plans in order to receive certain federal assistance; and,

WHEREAS, The University of New Orleans was awarded Hazard Mitigation Grant Program (HMGP) funds and the Disaster Resistant University Advisory Committee developed a Hazard Mitigation Plan Update; and,

WHEREAS, the University of New Orleans relied on its Center for Hazards Assessment, Response and Technology (CHART) and the Disaster Resistant Advisory Committee to develop a comprehensive hazard mitigation plan for the university's main and east campuses; and,

WHEREAS, the Disaster Resistant University Advisory Committee held meetings, facilitated by CHART, to study the university's buildings' risk from, and vulnerabilities to, natural and human-caused hazards and to make recommendations on mitigating the effects of such hazards on the university buildings; and,

WHEREAS, the efforts of the Disaster Resistant Advisory Committee and CHART have resulted in the development of The University of New Orleans 2011 Hazard Mitigation Plan Update.

NOW THEREFORE, BE IT RESOLVED by the Office of the Chancellor of the University of New Orleans, New Orleans, Louisiana, that the University of New Orleans 2011 Hazard Mitigation Plan Update, dated October, 2011, is hereby approved and adopted for The University of New Orleans.

ADOPTED this 28th day of October 2011.

Joe M. King,
Acting Chancellor

ATTESTED by

Jeanie Gambino Deemers
Facility Project Planner

ADOPTION PAGE INSERT SCANNED COPY

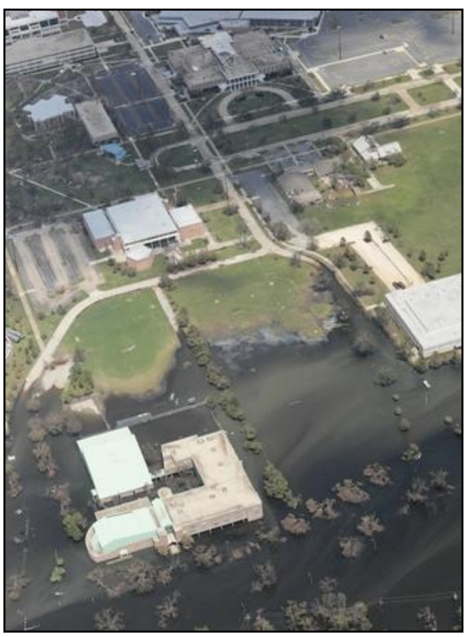
THE UNIVERSITY of NEW ORLEANS

Hazard Mitigation Plan

EXECUTIVE SUMMARY

INTRODUCTION

The University of New Orleans is subject to natural hazards and human-caused hazards, accidental or intentional that threatened life and health and have caused extensive property damage. To better understand these hazards and their impacts on people and property, and to identify ways to reduce those impacts, the University undertook the development of this Hazard Mitigation Plan.



Flooding on UNO main campus from Hurricane Katrina

Mitigation activities need funding. Under the Disaster Mitigation Act of 2000 (42 USC 5165), a mitigation plan is a requirement for Federal mitigation funds. Therefore, a mitigation plan will both guide the best use of mitigation funding and meet the prerequisite for obtaining such funds from The Department of Homeland Security's Federal Emergency Management Agency (FEMA). This *Mitigation Plan* meets the criteria of all these programs.

This *Hazard Mitigation Plan* was developed through a collaborative effort of the Research Team and the Disaster-Resistant University Advisory Committee at the University of New Orleans. The Research Team included members of UNO faculty and staff, representing the Center for Hazards Assessment and Response Technology (CHART), the Environmental Health and Safety Office, the Department of Political Science, the School of Urban and Regional Studies (SURS), and graduate students. The Disaster-Resistant Advisory Committee consisted of members representing a wide range of departments and offices from the University, and was a part of the already-established UNO Emergency Preparedness Committee created by the Chancellor.

> The sections in this Executive Summary correspond to the chapters in the full Plan. The full text of the UNO Hazard Mitigation Plan can be reviewed or downloaded from
>
> www.uno.edu

The Research Team led planning activities, and the Advisory Committee provided collaborative input, in addition to reviewing and critiquing the draft plan. In the review process, the same committee was convened and public meetings were held to bring in new input.

1. Hazard Profile

The Research Team reviewed the hazards and their effects on people and property, considered a variety of ways to reduce and prevent damage, and recommended the most appropriate and feasible measures for implementation. Its work was coordinated with various stakeholders, and a variety of local and state agencies and organizations, in addition to involving the community for public input.

The Committee reviewed 15 hazards that face the University of New Orleans in the 2006 plan, but this update adds two new hazards – storm surge (originally included in floods) and dam failure, which had been added to the State of Louisiana's Hazard Mitigation Plan. The Research Team identified these hazards as having affected the University in recent history or having the possibility of affecting it in the future. Chapter 2 reviews what causes them, their likelihood of occurrence, and their impact on people and property. The following is a list of hazards that are included in this Plan.

Natural hazards	*Human-Caused Hazards*
Floods	Hazardous Material Spills
Wind	Nuclear Accidents
Hail	Civil Unrest
Lightning	Terrorism (includes acts of student violence)
Storm Surge	
Winter Storms	
Subsidence	
Drought	
Earthquakes	
Termites	
Epidemics	
Mold	
Dam Failure	

2. Vulnerability Assessment

Chapter 3 reviews how vulnerable the University is to property damage, threats to public health and safety, and adverse impacts on university operations from each of the 17 hazards identified in the Plan. The vulnerability assessment consisted of a nine-step procedure ranging from collecting data on property, calculating damage costs for property by hazard, and determining impacts on people and university operations by hazard to summarizing the findings to compare the relative impact of each hazard. The conclusions are as followed and can be viewed in each of the summary tables.

- Some types of property and areas are more vulnerable than others. For example, buildings that contain basements are more vulnerable to flooding than other buildings. Buildings constructed of cinderbrick are more resistant to water damage by flooding, yet are more vulnerable to earthquakes than are structures of metal, wooden frame. Arena and frame structures are more vulnerable to wind damage, whereas concrete and steel structures are expected to be the most resistant to structural damage from wind, water, earthquakes, and termites.

- The hazard causing the greatest amount of destruction in a single event is a wind followed by levee break flooding and terrorism. The hazard that is likely to cause the most property damage over the long run is wind.

- The greatest threats to people during a single event are nuclear accidents, terrorism, hurricanes, tornadoes, and epidemics. Over the long run, the "people score" shows that greatest continuous threats are lightning, wind from tornadoes and storm surge.

- Hazards that have high impacts on university operations include levee break flooding, hurricanes, tornadoes, storm surge, and terrorist attacks. Over the long run, the greatest threats to University operations are wind from tornadoes and storm surge.

Property damage summary and frequencies

Hazard	Frequency	Dollar Damage	Average Annual $ Damage
Minor Flooding	1.55	$22,576	$35,725
Major/Hurricane Flooding	0.020	$71,196,990	$1,431,264
Wind - Thunderstorms	2.18	$0	$0
Wind - Tropical Storm	0.400	$34,419,834	$13,767,933
Wind - Cat I Hurricane	0.130	$18,283,255	$2,376,823
Wind - Cat 2 Hurricane	0.050	$27,417,956	$1,370,898
Wind - Cat 3 Hurricane	0.030	$66,038,362	$1,981,151
Wind - Cat 4 Hurricane	0.010	$66,144,869	$661,449
Wind - Cat 5 Hurricane	0.006	$665,597,035	$3,993,582
Wind – Tornado	0.28	$114,270,345	$31,995,697
Hail	0.57	$157,596	$89,830
Lightning	0.59	$695,267	$392,642
Storm Surge	0.90	$275,805	$247,100
Winter Storms	0.050	$695,267	$31,162
Subsidence	1.000	N/A	$73,393
Drought	0.03	$0	$0
Earthquakes	0.070	$7,339,302	$513,751
Termites	1.000	N/A	$224,000
Epidemic	0.030	$0	$0
Mold	0.020	$22,160,739	$469,222
Dam Failure	N/A	N/A	N/A
Haz Mat Spills	0.010	$1,737,668	$17,377
Nuclear Accidents	0.010	$6,137,397	$61,374
Civil Unrest	0.020	$13,901,348	$278,027
Terrorism	0.010	$91,993,308	$919,933

Summary of the impact on people

Hazard	Safety	Health	Mental Health	Single Event	Frequency	People Score
Minor Flooding	Low	Nil	Nil	12	1.55	18.60
Major/Hurricane Flooding	Mod.	Mod.	High	180	0.02	3.60
Wind - Thunderstorms	Nil	Nil	Nil	3	2.18	6.54
Wind - Tropical Storm	Mod.	Mod.	Low	90	0.40	36.00
Wind – Cat 1 Hurricane	Mod.	Mod.	Low	90	0.13	11.70
Wind – Cat 2 Hurricane	High	Mod.	High	240	0.05	12.00
Wind – Cat 3 Hurricane	High	Mod.	High	240	0.03	7.20
Wind – Cat 4 Hurricane	High	Mod.	High	240	0.01	2.40
Wind – Cat 5 Hurricane	High	Mod.	High	240	0.006	1.44
Wind – Tornado	High	Mod.	High	240	0.28	67.20
Hail	Nil	Nil	Nil	3	0.57	1.71
Lightning	High	Nil	Nil	102	0.59	60.18
Storm Surge	Mod.	Mod.	High	180	0.90	162.00
Winter Storms	Mod.	Low	Nil	51	0.05	2.55
Subsidence	Nil	Nil	Nil	3	1.00	3.00
Drought	Nil	Nil	Nil	3	0.03	0.09
Earthquakes	Mod.	Low	Low	60	0.07	4.20
Termites	Nil	Low	Nil	12	1.00	12.00
Epidemic	Low	High	High	210	0.03	6.30
Mold	Low	High	Mod.	150	0.02	3.00
Dam Failure	N/A	N/A	N/A	N/A	N/A	N/A
Haz Mat Spills	High	Mod.	Mod.	180	0.01	1.80
Nuclear Incidents	High	High	High	300	0.01	3.00
Civil Unrest	Mod.	Low	Mod	90	0.02	1.80
Terrorism	High	High	High	300	0.01	3.00

Summary of impact on university operations

Hazard	Impact on University Operations	Number Score	Frequency	Impact Score
Minor Flooding	nil	1	1.55	1.55
Major/Hurricane Flooding	high	100	0.02	2.00
Wind – Thunderstorms	nil	1	2.18	2.18
Wind - Tropical Storm	low	10	0.40	4.00
Wind- Cat 1 Hurricane	moderate	40	0.13	5.20
Wind- Cat 2 Hurricane	moderate	40	0.05	2.00
Wind- Cat 3 Hurricane	high	100	0.03	3.00
Wind- Cat 4 Hurricane	high	100	0.01	1.00
Wind- Cat 5 Hurricane	high	100	0.006	0.60
Wind – Tornado	high	100	0.28	28.00
Hail	nil	1	0.57	0.57
Lightning	low	10	0.59	5.90
Storm Surge	high	100	0.90	90.00
Winter Storms	low	10	0.05	0.50
Subsidence	nil	1	1.00	1.00
Drought	nil	1	0.03	0.03
Earthquakes	low	10	0.07	0.70
Termites	nil	1	1.00	1.00
Epidemic	moderate	40	0.03	1.20
Mold	moderate	40	0.02	0.80
Dam Failure	N/A	N/A	N/A	N/A
Haz Mat Spills	low	10	0.01	0.10
Nuclear Incidents	moderate	40	0.01	0.40
Civil Unrest	moderate	40	0.02	0.80
Terrorism	high	100	0.01	1.00

3. Mitigation Action Plan

Chapter 4 includes the Mitigation Action Plan based on the findings set forth in Chapters 2 and 3. It provides a review of the mitigation goals set for this Plan, a list of those goals, and recommended mitigation actions that will assist the University community in achieving those goals.

Following a review of goals and objectives from the original UNO Mitigation Plan and the Mitigation Plan for the Off-Site Locations, it was decided that these goals and objectives would remain with minor edits. The goals are organized under three general goal statements followed by six general strategies to implement them. These are used to guide the planning and implementation of mitigation activities and projects. The goals and strategies are as follows:

Goals:

1. *Protect the lives and health of the faculty, staff, students, tenants, and visitors.*

2. *Protect the University's buildings, contents, utilities, and infrastructure from damage by natural and human caused hazards.*

3. *Ensure that disruption to the University's operations and tenants' operations during and following an event will be minimal.*

Strategies:

1. *Protect, strengthen, or retrofit University buildings and facilities so they will suffer little or no damage during an incident and their occupants and contents will be protected.*

2. *Educate the faculty and staff as well as students and tenants, on ways to protect themselves and their property from damage by natural and human caused hazards.*

3. *Have the necessary emergency response facilities, equipment, staff, and procedures in place to minimize the danger and damage to people, University property, and the surrounding community during an incident.*

4. *Have the disaster recovery facilities, equipment, staff, and procedures in place to allow University facilities to reopen immediately after an incident, with minimal reliance on outside sources of assistance.*

5. *Pay special attention to certain special University resources, including Library holdings, student housing, records, and art collections.*

6. *Invest resources needed to reach the goals at a level appropriate to the hazard and its impacts on property, people, and University operations.*

Potential Mitigation Actions/Recommendations/Action Items

The Research Team along with the Advisory Committee identified several hazard mitigation actions that could benefit the University. These recommendations were based on a range of potential mitigation actions described in section 4.2. The recommendations were categorized according to areas of mitigation including flood protection, retrofitting, development and construction policies, emergency operations, university operations, and information and education.

Specific action items were then recommended based on the general recommendations stated in section 4.2 and with five factors in mind: hazards that pose the greatest threats, appropriate measures, costs and benefits, affordability, and environmental impact. Section 4.4 lists the 15 action items that address the major hazards, are appropriate for those hazards, are cost-effective, are affordable and have minimal negative impacts on the human and natural environment. The last section of the chapter addresses how these action items are to be implemented along with the adoption and revision of the mitigation plan.

Action Item 1. Maintain Permanent DRU Advisory Committee: ONGOING

The University's Mitigation Advisory Committee will continue to serve as a permanent advisory body, the DRU Advisory Committee. The Committee should continue to consider whether other individuals or groups should be invited to participate to ensure that all University interests are included in the process. They should also continue to work toward mitigation goals and engage in plan updates. This item has been completed, with the Advisory Committee continuing coordination and efforts, but will need to be maintained through the next update.

Action Item 2. Drainage System Evaluation: ONGOING

A review of the surface and subsurface parts of the drainage system will be conducted to ensure that all storage and conveyance facilities are designed and maintained to minimize flood damage to buildings. Evaluation of drainage is conducted with each new construction project, and drainage has been improved along Perimeter Road. As new Capital Projects and paving activities are conducted, this Action Item will continue.

Action Item 3. Retrofitting Measures: ONGOING

Buildings that were flooded by the Katrina levee breaks will be either (1) retrofitted with appropriate floodproofing measures or (2) rebuilt above the Katrina flood level. The retrofitting projects can be funded as mitigation actions under FEMA's Public Assistance program. Several projects have been scoped and are ready for enactment as funding becomes available.

Action Item 4. Safe Floor/Area: ONGOING

The University will design and construct a "safe floor" or "safe area", the "Campus Disaster Management Center" that will perform multiple functions. The University Computing and Communications building has been hardened and University Police have moved into this location to create such a center in a centrally-located position on the Main Campus.

Action Item 5. Target Building Evaluation: ONGOING

"Target buildings" will be evaluated separately to determine where they are vulnerable and to identify appropriate retrofitting or other protective actions. Additional buildings will be reviewed as needed. This activity is now part of a regular campus procedure.

Action Item 6. Future Development and Construction Policies Evaluation: ONGOING

The University has a variety of development and construction policies and procedures that govern how sites are developed and improved. These will be evaluated. Since 2006, a number of changes have been made to construction plans, largely in relation to knowledge gained during Hurricanes Katrina, Rita and Gustav.

Action Item 7. Master Plan Reassessment: EXPANDED/ONGOING

Pre-Katrina, the University of New Orleans had developed a FY 2006-2007 Capital Outlay Plan that would guide the university's major expenditures for the following 5 years. The plan contained several projects that took into consideration the costs of mitigation measures. The original Action Item referred only to this Capital Outlay Plan. However, it has come to the attention of the Advisory Committee that simply targeting the Capital Outlay Plan is not enough, and there are other plans that need integration with this plan. DRU Advisory Committee members sit on the committees for this other plan, and thus encourage this integration.

Action Item 8. Building and GIS Data: ONGOING

There is a wealth of information on the buildings, facilities and infrastructure on campus. However, a majority of the information is not in a format readily usable by police, fire and other emergency personnel. Some building floor prints have been collected and put into GIS, in addition to basic attributes to those buildings. Under this project, this work will continue and information will be collected, catalogued, organized, and provided in formats that first responders need. While the goal of this item is to have a fully integrated GIS for first responders, this task has not been fully completed. Now, on Sharepoint, there are digitized floor plans for every floor in every building on campus. However, this information has not been integrated with a GIS at this time.

Action Item 9. Emergency Operations Procedures: ONGOING

The University has several different plans for different hazards, emergencies, and contingencies. Under this action item, they will be reviewed, coordinated, and augmented as appropriate. A number of procedures have been developed for individual hazards, and this process is ongoing. Additionally, some members of the University Police staff have undergone advanced training.

Action Item 10. University Emergency Communications System: EXPANDED/ONGOING

The University will establish a system to identify an impending hazard as early as possible and to issue warnings appropriate to the situation. The original plan aspired at installing warning sirens. This was accomplished, with two sirens operational on campus at this time. However, the communications system has been expanded to include the e2campus alert system allowing for hazard and emergency information to be sent to registered faculty, staff and students via text message or email in addition to the shelter-in-place sirens. Currently, the University is exploring ways to improve information provided after a fire alarm has been sounded, and to incorporate emergency and disaster information through social media.

Action Item 11. Business Continuity Plan: ONGOING

The University will create a university-wide Business Continuity Plan (BCP) to serve as an asset in the disaster recovery process by ensuring that the University can continue mission critical functions. While an umbrella BCP has not been developed, it is now a requirement that each University unit have on Sharepoint a BCP for their unit. These plans should be reviewed and updated as needed, and the units should encourage familiarity among faculty and staff.

Action Item 12. Hazard Protection Education: ONGOING

A short training course on the hazards faced on campus and the appropriate safety and property protection measures will be developed. Since 2006, a University Success course has been added for all incoming freshman. Efforts are being made to incorporate more hazard preparedness information into this class. Additionally, funding from the Governor's Office of Homeland Security and Emergency Preparedness has allowed incorporation of hazard preparedness and mitigation to be incorporated into more curriculums.

Action Item 13. Hazard Protection Information Projects: ONGOING

Each year, the DRU Advisory Committee will institute a series of projects to advise faculty, staff, and students about hazard safety and property protection. Residential students are informed about hazard mitigation activities and preparedness by Campus Facilities staff. Evacuation information is available to all faculty, staff, students and visitors and is easily accessible at the University Center's information desk. While some projects have been implemented, this is an area that stands out as an area that could be improved upon.

Action Item 14. Increased Use of On-line Learning: ONGOING

The University will develop a plan to increase the continuity of university operations, particularly the continuance of classes in the event of a hazard. This plan will encourage more faculty and students to learn how to use UNO's web-based learning tools. The plan will include the requirement of faculty to have the ability to convert his or her classes to on-line classes in a specified amount of time. Blackboard has been upgraded to Moodle and all classes have at least a shell online. The University Senate has formed a committee to explore additional integration of online learning. This committee has increased online integration of classrooms, and has expanded its goals by forming a taskforce that is looking for new opportunities to teach courses in an online-only format.

Action Item 15. Violence Prevention/Mental Health: NEW ITEM

The University community will review current policies and procedures related to violence prevention and related mental health issues. Based on findings, a comprehensive Action Plan will be developed to address related issues including identifying and obtaining assistance for those members of the University community who may pose a danger to themselves or others. Although this is a new item, it was identified for the satellite campus plan, and progress has been made on this item. There is a campus safety committee that meets monthly to review new information and discuss appropriate mitigation actions. Members of the committee have had advanced training that include recognizing “red flags,” related to mental health and crisis control.

CHAPTER 1. INTRODUCTION

Disaster Resistant University Program:

In October 2004, the University of New Orleans (UNO) was awarded a Disaster Resistant University (DRU) grant under the Pre-Disaster Mitigation Grant Program administered by the Federal Emergency Management Agency (FEMA). The grant provided the necessary funding for UNO to develop and implement a pre-disaster hazard mitigation plan with the goal of reducing risk to its students, faculty and staff, academic, administrative and athletic facilities, and research assets. The original plan was adopted in October 2005. This funding also assisted with the raising of risk awareness throughout the University and surrounding community and the strengthening of collaborative efforts with local and state emergency responders.

The Hazard Mitigation Grant Program (HMGP) Expanded Mitigation Strategies Planning Grant Pilot was authorized by the Federal Emergency Management Agency (FEMA) in 2006. As administered in the State of Louisiana, it is referred to as the Planning Pilot Grant Program (Pilot Program). The Pilot program provides funds to update hazard mitigation plans and/or to identify and document feasible mitigation projects. Funding is derived from that seven percent of the Hurricanes Katrina and Rita HMGP fund that is available for the development of mitigation plans. The Pilot Program planning funds have been made available in part since there has been a change of regulatory standard, including the publication of FEMA-generated Advisory Base Flood Elevations (ABFEs), and the fact that many jurisdictions have experienced an extreme hazard occurrence that presents additional hazard information and unique mitigation opportunities. The funds assist applicants in updating their hazard mitigation plans to reflect new information such as the ABFEs and identifying cost effective specific mitigation projects, focusing on those particular types of projects that may be eligible for HMGP funding. This 2011 update is funded through the Pilot program.

1.1 INTRODUCTION

1.1.1 The Problem

The University of New Orleans (UNO) is subject to natural and human-caused hazards that threaten life and health and cause significant property damage. To better understand these hazards and their impacts on the University community, and to identify ways to reduce those impacts, an interdisciplinary research team at UNO undertook this Hazards Mitigation Plan.

UNO Lakefront Campus

In the last decade, disasters have affected university and college campuses with disturbing frequency, sometimes causing death and injury, but always imposing monetary losses and disruption of the institution’s teaching, research, and public service. The damage to buildings and infrastructure and interruption to the institutional mission result in significant losses that can be measured by faculty and student departures, decreases in research funding, at the least, and injury and loss of life at the extreme.

For example, Hurricane Katrina in 2005 caused severe damage to campus infrastructure, resulting in the closure of the campus for over four months. Losses like these could be substantially reduced or eliminated through comprehensive pre-disaster planning and mitigation actions.

These natural and human-caused disasters not only produce damaging effects to university and college campuses, they also bring about a monetary impact to the city and state in which the institution is located. For instance, UNO has a substantial influence on the economy of the City of New Orleans as well as the State of Louisiana. The University employs approximately 2,100 faculty and staff. The University generates more than $115 million in research grants and a budget of over $200,000,000. The importance of UNO to the community is also emphasized by the fact that the majority of all UNO graduates remain in the New Orleans area after graduation. U.S. News & World Report ranks UNO as the 16th most popular universities in the nation. Programs in Naval Architecture & Marine Engineering and film rank among the top in the nation.

The Lakefront Arena is located on UNO's East Campus.

Overall, effects of disasters extend far beyond the academic community, reaching the City of New Orleans and the State of Louisiana. Considering the well-being of a considerable number of students, faculty and staff, the economic impact and the potential hazards that face the city in which it resides, UNO has successfully sought funding from FEMA to reduce and manage its vulnerability to these hazards through the development of a comprehensive campus mitigation plan. Although the mitigation plan will target natural hazards, it will also focus on other hazards, including those that are human-caused, whether they may be intentional or accidental. The goal of this plan is to focus on identifying and reducing risks throughout UNO's Main and East campuses.

"Hazard mitigation" does not mean that all hazards are stopped or prevented. It does not suggest complete elimination of the damage or disruption caused by such incidents. Natural forces are powerful and most natural hazards are well beyond our ability to control. Mitigation does not mean quick fixes. It is a long-term approach to reduce hazard vulnerability. As defined by the Federal Emergency Management Agency (FEMA), "hazard mitigation" refers to any sustained action taken to reduce or eliminate the long-term risk to life and property from a hazard event.

1.1.2 Why this plan?

Every university faces different hazards and each has its own unique resources and interests to bring to bear on its problems. Because there are many ways to deal with natural hazards and many agencies that can help, there is no one solution or method for managing or mitigating their effects.

Planning is one of the best ways to correct these shortcomings and produce a program of activities that will best mitigate the impact of local hazards and meet other university needs. A well-developed mitigation plan will ensure that all possible activities are reviewed and implemented so that the problem is addressed by the most appropriate and efficient solutions.

It can also ensure that all activities are coordinated with each other and with other goals and programs, preventing conflicts and reducing the costs of implementing each individual activity. Since the University of New Orleans is a community within Orleans Parish, the university mitigation plan can coordinate with and compliment the mitigation plan developed by the Parish. Mitigation planning and defining the university's role during a crisis will assist both entities to collaboratively reduce or prevent damage from disasters.

Vulnerability studies conducted by the City of New Orleans demonstrate that New Orleans is extremely vulnerable to a myriad of disasters, which include but are not limited to flooding (which is identified as the most likely hazard), hurricanes, tornados, strong storms, hail, subsidence, drought, levee failure, epidemics, acts of terrorism, and nuclear accidents, to name just a few (Orleans Parish Hazard Mitigation Plan, 2010).

1.2 THE PLANNING PROCESS

This Plan is the product of an organizational group thought process that reviews alternatives and selects those that will work best for the situation. This process avoids the need to make quick decisions based on inadequate information. Key officials from the organization collaborated to develop the Plan and to update the original document.

The ability to build the capacity to conduct hazard mitigation planning, and have it remain resident within the University community was an important goal of the project. It was also recognized that a research methodology that included a high degree of collaboration by various stakeholders was essential to the development of a user-focused, comprehensive mitigation plan. This is exemplified by the various actors listed in section 1.3.

The Advisory Committee followed the following phases of the Planning Process per FEMA guidelines for components of a local hazard mitigation plan. In updating the plan, we conducted two public meetings to generate input and to discuss changes in language, new hazards and new strategies. The initial meeting was conducted to help identify new hazards and new mitigation strategies. The second meeting discussed changes indentified from the previous meeting and from comparing the current plan to existing plans for the satellite campuses, the City of New Orleans and the State of Louisiana.

Step 1: Hazard Identification and Analysis

This step involved describing and analyzing the 13 natural and four human-caused hazards to which the University of New Orleans could be susceptible. Chapter 2 contains the results of this planning step, includes historical data on past hazard events, and establishes an individual hazard profile and risk index for each hazard based on frequency, magnitude, and impact. The summary risk assessment in section 2.18 of the plan serves as the foundation for concentrating and prioritizing local mitigation efforts.

Step 2. Vulnerability Assessment

This step involved research and mapping, using best available data, to determine and assess current conditions.

Chapter 3 of the plan, which contains the results of this planning step, includes descriptions of buildings located on the main and east campuses of the University, damage potential to each of those properties, and potential impact on people and university operations for each of the 17 hazards reviewed in the plan.

Step 3. Goals and Objectives

Next, the Advisory Committee worked to formulate and agree upon general goals and objectives for the mitigation plan based on the hazard profile and vulnerability assessment. These goals were set to guide the review of possible mitigation measures and can be found in Chapter 4. Chapter 4 also provides a review of how the goals were set by the Advisory Committee.

Step 4. Mitigation Strategies

Based on the Goals and Objectives, the Advisory Committee formulated the mitigation strategies summarized in Chapter 4. The recommended mitigation actions were deemed appropriate for the University, reflective of school priorities, and consistent with other plans for the campus

Step 5. Action Plan

The Advisory Committee developed an Action Plan based on the mitigation strategies and goals. Mitigation projects or action items were then developed. This step included designating responsibility for implementation of each action. The committee also established a procedure for review and revisions of the plan. The review process provides for the general public to have input on plan review. Then they developed a procedure for a comprehensive review and update of the plan on a 5-year schedule. The results of this planning step are found in Chapter 4 of the mitigation plan.

Step 6. Adoption

The Chancellor of the University then adopted the Plan based on the recommendation by the Advisory Committee. The adoption followed a public review period.

1.3 ORGANIZATION

1.3.1 The Advisory Committee

The Advisory Committee members' names and positions are as followed:

Darlene Berggren, Auxiliary Services
Jim Burgard, University Computing and Communication
Monica Farris, Ph.D. CHART
Steven Day, University Police
Scott Whittenburg, Academic Affairs & Fiscal Administration
Marco Perez, Lakefront Arena
David Richardson, Environmental Health and Safety
James Royer, Facility Services

Tom Harrington, Public Safety
Joel Chatelain, Campus Services
Merrill L. Johnson, Academic Affairs
Janice Lyn, Student Life
Denise Perez, Student Wellness and Health Promotion
Deborah Hadaway, Facility Services
Sherri Ganucheau, Risk Management
Jeanie Decuers, Campus Services
Lee Robert, Facility Services

In order to develop a comprehensive campus mitigation plan that addresses multiple hazards, various planning activities were accomplished. These included a risk assessment, priority profiling of potential hazards, a vulnerability assessment, and multiple interviews with key stakeholders. Also, an interdisciplinary committee of resident experts from UNO was formed. These committee members represented a wide range of offices and departments, including the Center for Hazards Assessment Response and Technology (CHART), the Environmental Health and Safety Office, Student Affairs, Student Housing, University Administration including the Chancellor's Office, Academic Affairs, Facility Services, Human Resources, University Computing and Communications, Public Information, the Lakefront Arena and University Police.

These people were selected for this interdisciplinary advisory team to provide collaborative input, identify and develop mitigation strategies, review and critique plan drafts, and to provide diverse viewpoints in order to create a disaster-resistant university campus. Moreover, they were a part of the already-established UNO Emergency Preparedness Committee created by the Chancellor to discuss emergency issues and strategies on campus. These professionals have dealt with previous campus emergency situations.

1.3.2 The Research Team

Table 1.1 Hazard mitigation research team		
Participant	**Department**	**Position**
Monica Farris	CHART	Principal Investigator
David Richardson	Environmental Health & Safety	Safety Officer
John Kiefer	Political Science, Public Administration	Associate Professor
Carrie Beth Lasley	CHART-Urban Studies PhD, GIS	Research Assistant
Departments		
CHART = Center for Hazards Assessment and Response Technology	GIS = Geographic Information Systems	

The Research Team that led the plan update included CHART staff and UNO faculty and staff, representing CHART, the Environmental Health and Safety Office, and a CHART graduate student from the School of Regional and Urban Affairs.

The Research Team followed a standard process, based on FEMA's guidance and requirements. They assessed the hazards facing the University, set goals, and reviewed a wide range of activities that can mitigate the adverse effects of the hazards. The following sections of the chapter describe the tasks performed by the Research Team.

1.4 MITIGATION PLANNING

UNO Hazard Mitigation Plan Update Kick-Off Meeting, June 2011

The Research Team conducted a thorough risk assessment, identifying potential hazards that may impact the University of New Orleans. This information was gathered through newspaper articles in the local newspaper, the Times-Picayune; the Lexis-Nexis database; Internet websites such as the Federal Emergency Management Agency (FEMA) and National Oceanic and Atmospheric Administration (NOAA); insurance claim files made available by the UNO Office of Risk Management and the State of Louisiana Office of Risk Management; and hazard profiles developed by the City of New Orleans and the State of Louisiana. The significant data collected from these sources yielded a list of potential hazards that could affect UNO.

1.5 HAZARD PROFILE

Comprehensive maps of UNO's buildings along with building details and descriptions of each building, facility and infrastructure (when available) are now saved on the University's shared drive allowing access to those who plan, etc. These data provide information to the research team about campus facilities that could be affected by and/or that may need to be closed due to a variety of hazards such as flooding or power outages. These maps can be continually expanded and adapted for campus emergency personnel to use as an ongoing planning tool and serves as part of the University's geographic information system.

1.6 VULNERABILITY ASSESSMENT

A detailed inventory was conducted of campus assets during the organization phase. This inventory went beyond the mapping of the asset locations and provided the description and value of each asset valued at over $1,000.00 on campus. The vulnerability assessment was based on the hazard profiles and the inventory of assets of the University as reported by the UNO Department of Property Control and updated by the Office of Risk Management. This assessment helped determine what is actually at risk from an identified hazard, and allowed the Research Team to estimate potential structural and monetary losses, while at the same time prioritizing components of the mitigation plan.

The vulnerability assessment included a detailed description of each University facility in terms of its square footage, construction make-up (i.e., number of floors, type of foundation, roof material and construction, and building material), date of construction, and use. The Research Team also identified three critical structures; the Administration Annex, the University Communications and Computing Center (UCC), and the Central Utility Plant, as particularly vulnerable because of their importance to the continuity of campus operations and the high value contents. In addition, the Administration Annex is currently identified as a command center for top University administrators before and after hazard events, and campus-wide communication infrastructure is housed in the UCC. For these three facilities, engineering surveys were conducted to ascertain structural vulnerability. Since the update, more of the critical functions for the University have been moved to these buildings to create an emergency center inside the University Computing Center.

1.7 INVOLVING STAKEHOLDERS

1.7.1 Update Meetings

For the update, two public meetings were held on campus seeking Plan input and the resulting information was integrated into this document. The first meeting was held on July 12, 2011 during the drafting phase of the Plan. The second meeting was held on September 13, 2011 following the completion of the first full draft but prior to the Plan's final adoption and approval. Both meetings were advertised in *The Times-Picayune* and UNO News (sent via email by UNO Public Relations to all UNO email addresses).

The full draft Plan was posted on UNO-CHART's website for review. Stakeholders were given the opportunity to voice comments/questions at both meetings and/or submit comments/questions via UNO-CHART's email address before and after both meetings. Changes largely occurred as the result of changes to University since the previous plan or because of changes in Plan requirements.

1.7.2 Update Stakeholder Interviews

Additional interviews were conducted with faculty/staff at UNO throughout the drafting process. These included interviews with David Richardson, Safety Officer, Sherri Ganucheau, Risk Management, Lee Robert and James Royer, Facility Services and Steve Day, University Police, to gather information pertaining to emergency operations and response to hazards. For the update, information that needed to be collected was identified and stakeholders and informants sought to fill in gaps about new hazards and changes to the University's physical plant and operations.

1.8 COORDINATION

Existing plans and programs were reviewed during the planning process. Reviewed items include all university emergency and evacuation plans including the Bomb Threat Response Procedure, Bomb Scare Procedures, Significant Rain Event Response Plan, Hurricane Preparedness Guidelines and Action Plan, the university FY 2006-2007 Capital Outlay Plan and other master plans that guide University policies and procedures. The UNO Mitigation Plan for its Off-Campus Locations 2011, the Orleans

Parish Hazard Mitigation Plan (2010) and the Louisiana State Hazard Mitigation Plan (2010) were also reviewed. These local planning mechanisms were reviewed and incorporated as appropriate into the UNO Hazard Mitigation Plan. Please refer to Chapter 4, Action Item 7, of the Plan for a complete overview of campus planning mechanisms.

The UNO Hazard Mitigation Plan Update will be made available for incorporation into local planning mechanisms and other plans will incorporate the goals and strategies of the *Plan* through the following process:

- The *Plan,* including all Updates*,* will be distributed to all University departments charged with developing and maintaining other University planning mechanisms to include all Plans mentioned here.

- The DRU Advisory Committee will be charged with reviewing other planning mechanisms to ensure that the contents of each reflect and do not contradict the *Plan* (See Chapter 4 for an overview of the Committee's responsibilities).

- DRU Advisory Committee members will serve on other planning committees on campus. Members will be charged with incorporating the strategies and goals of *The Plan* into other existing planning exercises and documents as appropriate, and will see to it that planning mechanisms external to *The Plan* do not contradict its goals and strategies.

- All University plans, including the Capital Outlay Plan, the Strategic Plan, and the Institutional Effectiveness Plan, will be reviewed annually in light of the annual report produced by the DRU Advisory Committee. At this time, appropriate mitigation projects and other plan elements should be considered for inclusion in these planning documents.

As of this Plan Update, the "consideration of mitigation and risk reduction" is specifically mentioned in UNO's 2007-2010 Strategic Plan. In addition, the Strategic Plan sets goals related to emergency awareness and alerts, incorporating hazard mitigation in rebuilding efforts, upgrading the electricity in the UCC, ensuring redundancy of the network, and incorporating disaster planning into the business continuity plan for all units. No specific elements of the current Mitigation Plan were incorporated in any other UNO plan except of course for the Mitigation Plan for the Off-Campus Locations.

During the planning process, contacts were made with various agencies and organizations (See following list for names of Agencies and Organizations that were contacted). Each agency/organization was sent a notice via email requesting their review of the draft Plan, providing them a link to view the plan, and inviting them to an upcoming hazard mitigation planning public meeting. They were advised that the draft could be reviewed on the CHART website and they were asked to provide any comments or relevant information regarding any plans, programs, activities, or ideas that could help in the effort to identify the best ways to reduce the dangers and damage from future hazards. The organizations and/or agencies were asked to provide any information by contacting the planning team. In addition to the direct emails, all stakeholders were invited to participate in two public meetings via posts in *The Times-Picayune* and the UNO News (sent via email by UNO Public Relations to all UNO email addresses).

Agencies:

1. Federal Emergency Management Agency Region VI
2. Governor's Office of Homeland Security and Emergency Preparedness
3. Orleans Parish Hazard Mitigation Office
4. Orleans Levee District

Organizations:

1. Ben Franklin High School
2. Lakeview Civic Improvement Association
3. Lakeview Crime Prevention District
4. Gentilly Neighborhood Association
5. LSU Cooperative Extension Services
6. National Weather Service
7. Southeast Louisiana American Red Cross
8. Salvation Army
9. Burbank Civic & Improvement Association
10. Milneburg Civic Association
11. Gentilly Heights/East
12. Lake Oaks Civic Association
13. Lake Terrace Property Owner's Association
14. Oak Park Civic Association
15. Seabrook Neighborhood Association
16. Vista Park Civic & Improvement Association

1.9 HAZARD IDENTIFICATION AND ASSESSMENT

An extensive profile of potential UNO hazards was created based on historical accounts, existing emergency plans, and knowledge of students, faculty, and staff. The various hazards identified through the risk assessment were then prioritized based on the likelihood of occurrence, severity of the hazard and cost of damage to the University. This information provided a basis for mitigation planning efforts in terms of focus and allocation of resources. The hazards reviewed include those locally reported and all natural hazards listed in the State and Orleans Parish Hazard Profiles. They are:

Natural Hazards

Floods*
Wind*
Hail
Lightning
Storm surge
Winter storms
Subsidence
Drought
Earthquakes
Termites
Epidemics
Mold
Dam Failure

Human-caused Hazards

Hazardous materials spills
Nuclear accidents
Civil unrest
Terrorism

*Hurricanes are included in these hazard descriptions.

The hazard data, any public input, and the Advisory Committee's findings and conclusions are covered in Chapter 2 of this Plan. For this update, the list of hazards was updated to include storm surge and dam failure. Chapter 2 assesses each hazard – what causes it and the likelihood of occurrence. Chapter 3 reviews the impact of these hazards on UNO.

1.10 GOALS

After the Advisory Committee reviewed the hazards, it developed the goals to mitigate their impacts. These are listed in Chapter 4. They were used to guide the selection of mitigation measures. These goals were maintained for the update with some revision to accommodate a more inclusive language that better coordinated with the hazard mitigation plan developed for the satellite locations.

1.11 MITIGATION STRATEGIES

The Research Team, in consultation with the Advisory Committee, considered a wide range of strategies that could positively affect the impact of the hazards and developed alternatives. They are organized under five general strategies for reaching the goals.

These strategies are the subject of Chapter 4 in this Plan.

- Property protection – e.g., relocation out of harm's way, retrofitting buildings
- Preventive – e.g., restricted access to sensitive areas, securing power plant
- Emergency services – e.g., warning, response, evacuation
- Structural projects – e.g., drainage improvements
- University operations
- Public information – e.g., outreach projects

For this update, strategies from the previous plan were evaluated by the team and Advisory Committee. The existing strategies were deemed still relevant and important. As such, it was decided that these strategies would remain the same.

1.12 ACTION PLAN

After the alternatives were reviewed, the Research Team drafted an "action plan" that specifies recommended projects, who is responsible for implementing them, and when they are to be done. The action plan is included as Chapter 4 of this Hazard Mitigation Plan. Each action item was carefully reviewed during the update process by the Research Team and the Advisory Team. The actions were also presented during the public meetings. The action plan now includes one new action item, Item #15 – Violence Prevention/Mental Health. This action item was identified during the team and Advisory Committee's coordination in developing the satellite campuses plan and was included in the 2011 update for the main campus as well. The remaining action items were updated based on any progress made in completing the actions.

Plan maintenance was highlighted in the update with specific information added on how the public could better participate in plan updates and overall plan maintenance.

1.13 PUBLIC PARTICIPATION

There are many ways that the public could participate in the drafting of this hazard mitigation plan. The Research Team identified the most effective ways for public participation.

The campus community and neighboring communities along with local and regional agencies involved in hazard mitigation activities were provided with opportunities to comment on the action plan during the drafting stage and prior to approval of the plan. The various agencies and organizations along with neighborhood community associations are listed in section eight of this chapter.

After the draft action plan was completed, a news release was issued by the UNO Public Relations staff announcing the plan, and it was posted on the University of New Orleans web site for public review. A special link, "UNO Hazard Mitigation Plan ready for public input," directed individuals to the hazard mitigation plan.

Prior to the approval of the Plan, a news release was again sent to the UNO community announcing that revisions to the Plan were posted on the University's website and were available for review. A special link directed individuals to the revised plan.
The public was invited to submit comments. .

Again, two public meetings were held prior to the completion of the draft. All comments were incorporated into the final draft.

1.14 UPDATING THE PLAN

- **Planning Process:** The DRU Advisory Committee has been active since the previous plan was created. In updating the planning process, we conducted two public meetings, inviting the participation of the Advisory Committee, to generate input and to discuss changes in language, new hazards and new strategies. The initial meeting was conducted to help identify new hazards and new mitigation strategies. The second meeting discussed changes indentified from the previous meeting and from comparing the current plan to existing plans for the satellite campuses, the City of New Orleans and the State of Louisiana. In both plans, ideas, progress and new mitigation strategies were requested from participants

- **Risk Analysis:** To update the risk analysis, state and local plans were reviewed to see how others classified hazards. Vulnerability was updated on conjunction with Risk Management. The values and uses of buildings were confirmed or updated. New construction was added to the list and frequencies were recalculated.

- **Mitigation Strategy:** The team and UNO community reviewed the existing mitigation strategies and added one new activity. Several other activities were updated or enhanced based on progress since the initial plan or because of changing conditions or knowledge about University processes.

- **Plan Maintenance:** By gaging the capabilities and successes of the previous five years, the current planning process was carried over and enhanced. Enhancements include regular annual updates, and hosting a public comment period and public meeting to seek review between official plan updates.

1.15 DESCRIPTION OF THE AREA OF STUDY

The University of New Orleans was established by the Louisiana Legislature in 1956. It was created to bring public-supported higher education to the state’s largest urban community.

The Board of Supervisors acquired a 195-acre site in New Orleans, Louisiana on the south shore of Lake Pontchartrain. The property was a former United States Navy air station.

TABLE 1.2 UNO Student Population Breakdown	
White	56%
African-American	14.6%
Hispanic	6.7%
Asian	5.6%
International	650 students

A number of the buildings remaining on the property were renovated for academic purposes during the winter and spring of 1958. In September 1958, Louisiana State University in New Orleans opened. It was later renamed the University of New Orleans in 1974. By 1962, the University was operating as a full four-year, degree-granting institution. Today, programs of study are offered through six academic undergraduate colleges, including: Business Administration, Education and Human Development, Engineering, Liberal Arts, Sciences, and Urban Studies. There is also a Graduate School. (www.uno.edu, 2011).

The University of New Orleans main campus consists of 20 major academic, administrative, and residential buildings, while the East Campus consists of 200 acres that include an arena with the seating capacity for 10,000 people, sports facilities, and one administrative building. UNO is a public university with an approximate enrollment of 11,000 students (8,000 undergraduates and 3,000 graduate students) resulting in its ranking as the largest public university in the city and the third largest in the state. The student body is diverse with 56% white, 14.6% black, 6.7% Hispanic, 5.6% Asian, and approximately 650 international students. The University is comprised of a faculty and staff of over 2,100 people (www.uno.edu, 2011).

The University of New Orleans is classified as a Southern Regional Education Board Four-Year II institution, as a Carnegie Doctoral/Research Intensive University, and as a Southern Association of Colleges and Schools Level VI institution. It was officially transferred from the Louisiana State University System to the University of Louisiana System in July 2011, and the transfer was under way at the writing of this update. The University of New Orleans has become a comprehensive urban university that provides academic support for the enhancement of the educational, economic, cultural, and social well-being of the New Orleans metropolitan area (www.uno.edu, 2011).

1.15 REFERENCES

Office of Emergency Preparedness. (2010). “Orleans Parish Hazard Mitigation Plan”. City of New Orleans.

Louisiana Governor’s Office of Homeland Security and Emergency Preparedness. “ (2010). “Louisiana State Hazard Mitigation Plan.” State of Louisiana.

CHAPTER 2. HAZARD PROFILES

This chapter reviews the natural and human-caused hazards that face The University of New Orleans Main and East campuses. The hazards described here are based on the State of Louisiana Hazard Profile, the City of New Orleans Hazard Profile, the University of New Orleans Hazard Profile (Off-sire locations) and/or were identified by the Research Team as having affected the specified locations in recent history.

Natural Hazards	**Human-caused Hazards**
Floods (Stormwater, groundwater, levee faiur and hurricane)	Hazardous materials spills
Wind (Thunderstorms, tornadoes Tropical storms and hurricanes)	Nuclear accidents
Lightning	Civil unrest
Storm surge	Terrorism
Winter storms	
Subsidence	
Drought	
Earthquakes	
Termites	
Epidemics	
Mold	
Dam Failure	

This chapter has seventeen sections, one for each hazard identified in this Plan. The first two natural hazards, floods and wind, are actually the result of a variety of occurrences such as tropical storms, hurricanes, tornadoes, and levee failure. Rather than address each of the aforementioned occurrences as separate hazards, this Plan examines these from their potential impacts: flooding and high winds.

2.1 FLOODS

2.1.1 Description

Floods are caused by the presence of more water than the drainage system can convey. There are a number of types of flood hazards facing UNO's Main Campus and East Campus: stormwater flooding; groundwater flooding; riverine flooding (e.g., 'overbank' or 'backwater' flooding); and extensive flooding resulting from levee failure. A number of natural events can bring about flooding, including thunderstorms, heavy and/or prolonged rain events, and tropical storms and hurricanes. Potential for flooding from storm surge and dam failure are covered in sections 2.5 and 2.13, respectively.

Campus Rain Event August 2010

Minor Flooding Types

Stormwater Flooding:

Stormwater flooding typically follows local heavy rains. Stormwater drainage can be a problem during heavy rain storms, and thus surface flooding is common. Additionally, the levees that protect the densely populated areas of Orleans Parish make it more difficult for stormwater to flow out. Stormwater must be pumped over the levee system and into Lake Pontchartrain or other local waterbodies. There are 22 drainage pumping stations that perform this task, and they can drain the city of 29 billion gallons a day (Sewerage & Water Board of New Orleans 2011). Flooding in New Orleans occurs most frequently in the summer and early fall due to weather patterns that allow for monsoon-like storm events fed by heat and humidity. The pumping system can remove approximately one inch of rainfall in the first hour, and one-half inch each additional hour from the city, and therefore large storms can overwhelm the city leading to localized flooding problems, especially in lower-lying areas (Monteverde 2009).

Example of a clogged storm drain inlet

In the case of UNO's Main and East campuses, stormwater flows from the high ground near the lake toward Leon C. Simon Boulevard, affecting off-campus parking as well as ingress and egress points on campus as storm drains are overwhelmed and water backs up into the roadways. Clogging from debris can create a situation in which stormwater is unable to access the underground drainage system and backups ensue with smaller rain events than would be expected.

Groundwater flooding:

Groundwater is sub-surface water, and the potential for groundwater flooding increases with the proximity of a structure to the water table. The distance between the ground surface and the water table varies from place to place, and the distance decreases in times of heavy precipitation.

Groundwater flooding is a concern for all of UNO's campus locations as locally heavy precipitation may produce flooding in areas other than delineated floodplains or along recognizable drainage channels. If local conditions cannot accommodate intense precipitation through a combination of infiltration and surface runoff ("sheet flow"), water may accumulate ("pond") and cause flooding problems.

Drainage of floodwaters in Orleans Parish is accomplished through a system of subsurface drainage lines, canals and drainage pump stations. This system has proven in the past to be inadequate to handle certain volumes of floodwater which has led to groundwater flooding.

Basements are particularly prone to flooding from groundwater. Two buildings on UNO's campus have basements – the Liberal Arts Building and the Sciences Building. However, underground electrical components are also threatened by groundwater flooding.

Major Flooding Types

Riverine Flooding:

Flooding of rivers and their tributaries and floodplains may occur during periods of heavy precipitation as a result of runoff. The Bonnet Carré Spillway serves as the primary flood control system for the Lower Mississippi River Valley; located in nearby St. Charles Parish, the floodway protects New Orleans and other nearby and downriver communities from major Mississippi River flooding by diverting excess water into Lake Pontchartrain. Additional upstream floodways include the Morganza Floodway and the West Atchafalaya Floodway. Although flooding from the Mississippi River is unlikely to affect the Main and East Campuses of UNO, maps released during the May 2011 Mississippi River flooding event indicated that up to 20 feet of water from the Mississippi River is possible should the floodways not be operated in time.

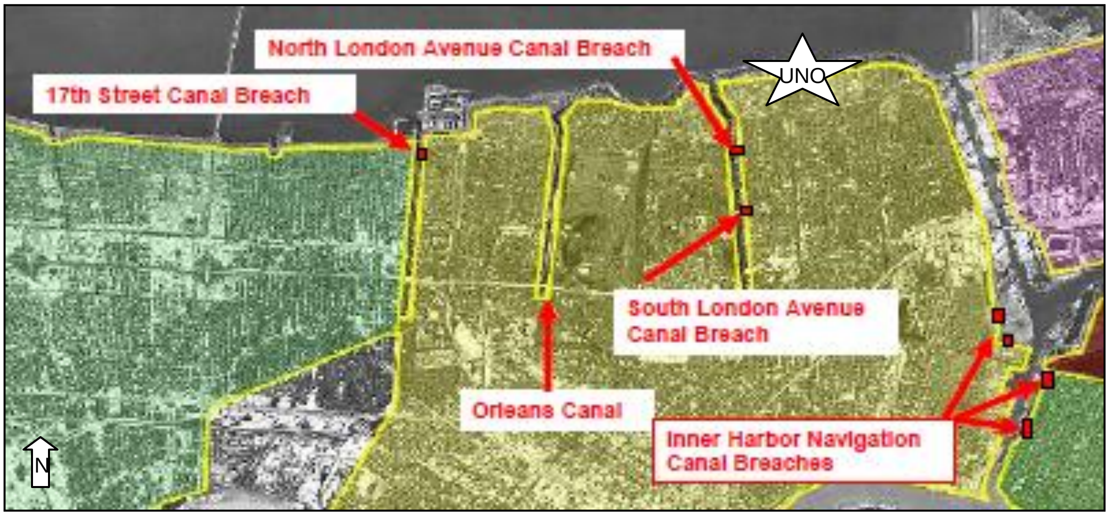


Figure from the U.S. Army Corps of Engineers' Interagency Performance and Evaluation Team Report

Two breaches in the London Avenue Levees caused flooding on UNO's Main Campus during Hurricane Katrina in 2005

Levee Failure Flooding:

Levee failure flooding could result from a number of factors during a natural hazard event, including surface or internal erosion, under-seepage, and overtopping. The primary levee, north of the Main and East Campuses along Lake Pontchartrain was not breached during Hurricane Katrina in 2005, and has been lifted since that event. However, a storm surge that overtopped this levee could lead to flooding on the Main and East Campuses of greater than 10 feet. Two breaches along the interior London Avenue Canal during Katrina exposed the secondary weakness of the interior levees, allowing floodwaters to come from the south and flood parts of the Main Campus.

The effects on campus should the Lake Pontchartrain levees fail will be described in the profile of storm surge.

Flooding on Leon C. Simon Boulevard (southern boundary of campus)

2.1.1.1 Hurricane Flooding

Hurricane flooding can be either minor or major. Smaller storms or those that make landfall farther away, including Hurricanes Gustav and Ike in 2008, cause just minor flooding due to the volume of rain, which can cause either/both groundwater or storm water flooding. During these events, the levees protected the City and the University from major flooding. In the event of a levee failure or a storm surge that exceeds the levee design, the University may experience levee failure or storm surge, which will be profiled in section 2.5.

Most Hurricanes to flood the area have caused just rainfall flooding, Hurricane Andrew (2000), Hurricane Betsy (1965) and Hurricane Camille (1969) caused about 6 inches of rainfall in the area, but dropped as much as 11 inches in nearby areas.[2] According to the NCDC, Hurricane Katrina (2005) included 8-10 inches of rain, causing minor flooding on campus, but it was levee failure that caused major flooding on the South and west parts of campus. Storm surge contributed to levee failure, but did not overtop the lakefront levees.

2.1.2 Area Affected

The state of Louisiana is highly prone to flooding, and it is the state's most prevalent natural hazard. This is largely due to Louisiana's location near the end of the Mississippi River Basin and its proximity to the Gulf of Mexico, in addition to the number of rivers, streams, and bayous throughout the state. Also, the climate throughout most of the state lends itself to heavy rainfall. The delta area of southeastern Louisiana, including Orleans Parish where UNO's main and East campus are located, receives the highest rainfall of any other part of the state. Hence, both campuses are susceptible to flood hazards.

There are three ways to examine flood risk at the current time:

1.) The effective Flood Insurance Rate Map (FIRM) for Orleans Parish is undergoing modernization as this document is written. This map indicates that the UNO Campuses lie in an AO Zone for flooding and are subject to sheetflow of up to 1.5 feet above grade during a flood with a 1 percent annual chance of occurring.

2.) The Advisory Base Flood Elevation (ABFE) is the current standard for all new construction in New Orleans. The ABFE is 3 feet above the highest existing adjacent grade, or the elevation indicated on the effective FIRM, whichever is higher. In the case of UNO, which is subject to just 1.5 feet in the effective FIRM, the ABFE would be the regulatory standard.

3.) The Preliminary Digital Flood Insurance Rate Map is available for review at this time. Likely to be adopted before this plan is updated again; it represents the best available knowledge of current flood risk. It places the majority of both the Main and East campuses out of the regulatory flood zone for a 1 percent annual chance of flooding. However, areas west and near Founders Boulevard, and near Leon C. Simon Boulevard are considered to be in the AE Zone, a zone at risk for flooding up to 1 foot above sea level. Buildings in this zone include: The Cove, Facility Services, Lafitte Village, the Bicentennial Education Building, Geology & Psychology Building, Science Building, Engineering Building, The Commons, the Oliver St. Pe Center, Bienville Halls, Pontchartrain Halls and the Human Performance Center. These buildings would be subject to flooding to the level of 1 foot above sea level, but in a number of cases, the ground level exceeds this height.

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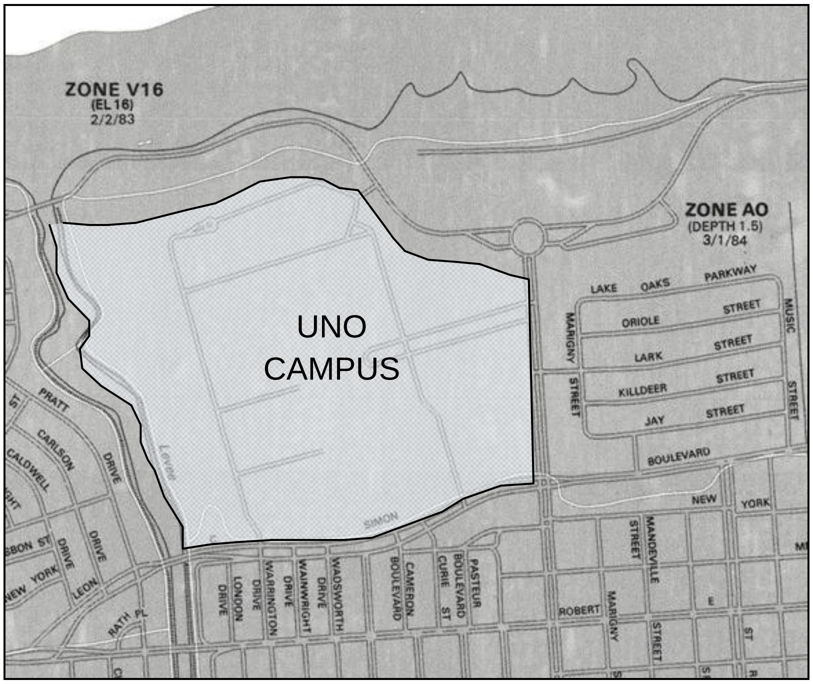
[2] Pfost, Russell L. (1993) Rainfall Patterns and Hurricane Andrew: A Hydro-meteorological Survey. *Technical Attachment. Slideall, La: Lower Mississippi River Forecast Center.*



Excerpt from Orleans Parish Flood Insurance Rate Map, Panel 95, March 1, 1984

2.1.3 Historical Occurrences

Stormwater flooding, although most typical in the summer or early fall, can happen at any time of the year. The May 1995 stormwater flooding event is one such event commonly referred to in the area. A two-day period inundated the New Orleans area with up to 20 inches of rainfall during a 12-hour period. Damages in the New Orleans region totaled $1 billion. The May 1995 event was a federally declared disaster. However, smaller storms have caused localized flooding and damages. Local media reports state that flash flooding from storm events occurred in March 2011, when 2 inches of rain fell

Hurricane Betsy’s flooding

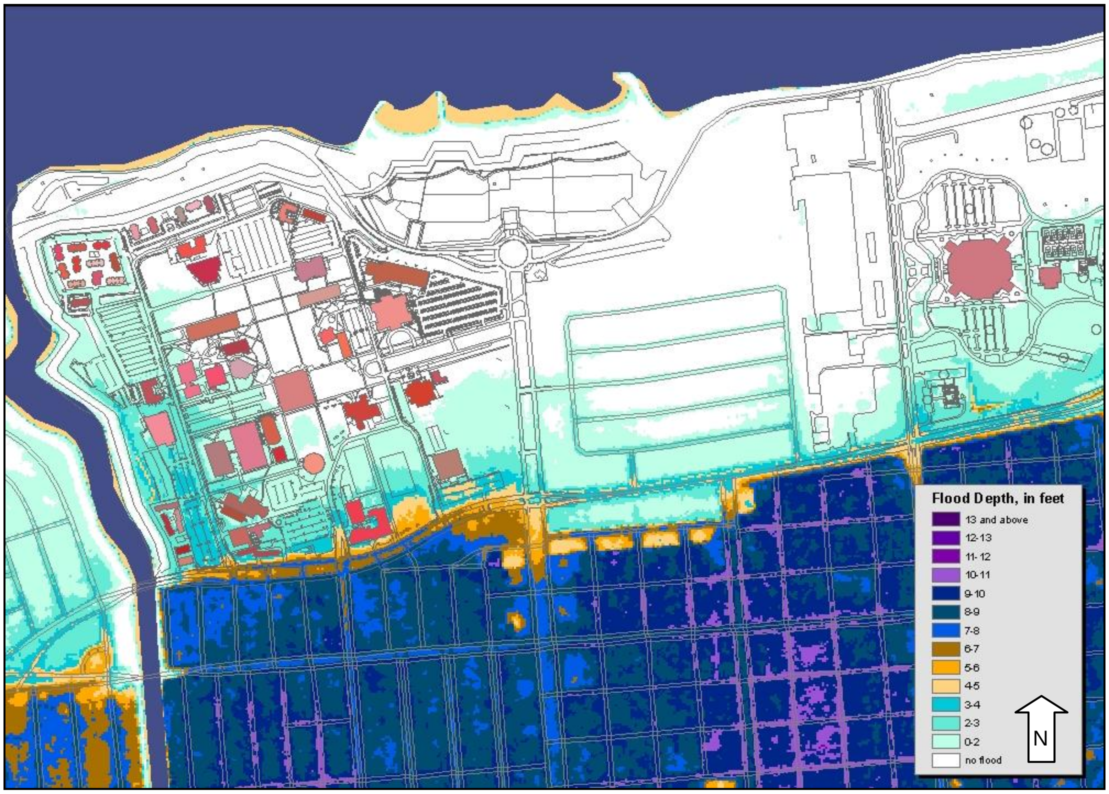
in less than two hours, and several times in December 2009 when there were rainfalls of greater than 3 inches on four occasions within a week's time.

Groundwater flooding is brought on by heavy rains and thunderstorms, as well as tropical storms and hurricanes. All 14 Federally Declared Disasters for New Orleans since 1965 have involved rain events. Over the last 20 years, four of these events have entailed 10 inches or more falling in a 24-hour period.

The two major levee failure flooding events in New Orleans' recent history have occurred as a result of Hurricanes Betsy (1965) and Katrina (2005). Other storms have caused flooding in Orleans parish but had limited or no affect on campus.

During Betsy in September of 1965, the waters of Lake Pontchartrain overtopped the levees, flooding some sections of the city. Betsy's maximum winds were up to 140 mps and made landfall near the mouth of the Mississippi River. Levee failure occurred south of the University of New Orleans along the Industrial Canal, but this flooding did not affect campus, which was flooded by rain. About 164,000 homes were flooded by Hurricane Betsy. Betsy was the first hurricane to result in $1 billion in damage, and 58 lives were lost.

The flooding that resulted from Hurricane Katrina was far more extensive, and multiple levee breaches around the city caused the majority of the city of New Orleans and part of the UNO campuses to be inundated – in addition to widespread flooding throughout parishes bordering Orleans Parish (e.g., Jefferson, Plaquemines, and St. Bernard). Prior to impacting the Gulf Coast, Hurricane Katrina reached Category 5 intensity before wind shear and impact with the coast reduced the storm to Category 3 strength with sustained winds of 130 mph upon landfall August 29 at Buras in Plaquemines Parish. On August 28, a mandatory evacuation of the city was enforced, and campus was absent of faculty, staff, students and residents at the time of the event. The storm surge of up to 28 feet overcapacitated the levee system at several locations, causing failures, breaches and overtopping in various locations. This storm surge exceeds what is expected from a Category 3 storm, and is more in line with what would be expected from a Category 5 storm. More than 220 miles of levees would need to be repaired or restored after Katrina's impact. While the most severe impact was felt southeast of campus in the Lower Ninth Ward and St. Bernard Parish, about 80 percent of the city was impacted including some areas of campus as identified in the map below which identifies the footprints of University of New Orleans buildings and flood depths on campus and in the surrounding area. In all, more than 134,000 structures were flooded in Orleans Parish. Although hurricane flooding on campus was limited to areas on the south and east portions of campus, and much of campus was dry, some of the most severe flooding occurred just off campus and many nearby residents who did not heed the evacuation orders occupied campus to secure dry clothing, food and water.



Areas flooded by the Hurricane Katrina levee break. Building footprints in the map correspond to University of New Orleans properties.

The final costs wrought by Hurricane Katrina in southeast Louisiana remain unknown; however, estimates from the National Hurricane Center suggest that at least $81 billion of damage occurred.

Flooding during Hurricane Katrina began after the London Avenue Canal was breached in two locations. Lower-lying portions of campus in the south and west were flooded from these breaches beginning on August 30, 2005. Students, faculty and staff had been evacuated for the event, but property damage from flooding included damage to carpet and floor tiles, warping of wooden and particle board furniture and damage to contents. Additionally, there was damage to infrastructure, including HVAC systems located in the basement of Liberal Arts.

Hurricane Rita reinundated some of these areas less than a month later, when on September 24, 2005, the storm made landfall in Johnsons Bayou Louisiana in far western Cameron Parish. Although a Category 3 storm at landfall, Rita, too, achieved Category 5 strength while over open Gulf waters. Storm surge from Rita entered through unrepaired breaches. The impact on campus is combined with damages from Hurricane Katrina since the campus had not yet been reoccupied.

During Hurricane Gustav in 2008, the city was under a mandatory evacuation, so there were not students, faculty or staff on campus. On September 2, 2008, Gustav came ashore as a Category 2 hurricane in Cocodrie, with winds sustained at 105 mph. Although surges were as high as 13 feet, the levee system near campus held and did not experience overtopping. The levee system held, and flooding was limited to minor drainage issues along Perimeter Road. Less than a month later, Hurricane Ike passed offshore prior to making landfall as a Category 2 hurricane on September 13, 2008 in Galveston, Texas. Although landfall was far away, its path and size caused low-land flooding and damage in Southeastern Louisiana. There was no flooding or damage to campus, but it forced the cancellation of classes for one day.

2.1.4 Frequency

Minor Flooding: *Stormwater and groundwater flooding:*

These two sources of flooding are connected. In Orleans Parish, there have been 28 minor flooding events since 1994.[3]

Frequency: 1.55.

[3] The data used to calculate the frequency of flood events – and the data used to calculate the frequency of all the hazards events listed in this hazard mitigation plan – are drawn from the National Oceanic and Atmospheric Administration's National Climatic Data Center (NCDC). The Storms Events database contains the following sources: (1) all weather events from 1993 - 1995, as entered into Storm Data. (Except 6/93 - 7/93, which is missing) (NO Latitude/Longitude); (2) all weather events from 1996 - Current, as entered into Storm Data. (Including Latitude/Longitude); and (3) additional data from the Storm Prediction Center, including tornadoes (1950-1992), Thunderstorm Winds (1955-1992), and Hail (1955-1992).

Table 2.1 Recent Minor Flood Events, Orleans Parish

Date	Number of Deaths	Property Damage
05/09/1994	0	$500,000
05/08/1995	4	0
05/19/1997	0	0
01/05/1998	0	0
03/07/1998	0	0
04/29/1998	0	0
08/21/1998	0	0
09/11/1998	0	0
08/09/1999	0	0
06/05/2001	0	0
06/07/2001	0	$25,000
06/11/2001	0	$50,000
06/21/2001	0	0
08/17/2002	0	0
08/22/2002	0	0
09/25/2002	0	0
06/19/2003	0	$150,000
06/30/2003	0	$130,000
12/21/2006	0	0
10/22/2007	0	0
04/26/2008	0	0
06/15/2008	0	0
06/29/2008	0	0
03/27/2009	0	0
09/13/2009	0	0
12/12/2009	0	0
04/23/2010	0	0
05/16/2010	0	$10,0000

Source: National Climatic Data Center website.

Major Flooding: *Levee failure flooding:* A 1993 FEMA Flood Insurance Study for Orleans Parish recognizes that federally built levees were considered to remain intact during the 100-year storm event. Proper maintenance of the levees is essential in maintaining the level of protection from the levees. As the levees consolidate and/or subside, the frequency and severity of surge overtopping could increase and create higher hazards in the areas protected by the levees. Congress authorized the Lake Pontchartrain project to protect the New Orleans from flooding caused by storm surge or rainfall associated with a hurricane that had the chance of occurring once in 200 years. This was termed as the “standard project hurricane” and represented the most severe combination of meteorological conditions considered reasonable for the region. As hurricanes are currently characterized, the Corps’ standard project hurricane approximately equals a fast-moving category 3 hurricane, according to the Corps.

Weaknesses in the levee system were revealed by Katrina. This plan estimates that deeper flooding caused by levee failure could affect the campus once every 50 years.

Frequency: 0.02

Hurricane Flooding: Previous flooding from hurricanes has occurred only in association with a levee break. Using the same standards as in levee failure, water should not over top and levees should not break for smaller hurricanes. Using the Corps standard, hurricane flooding should occur just once every 50 years.

Frequency: 0.02.

Major flooding on UNO main campus due to levee failure

2.1.5 Threat to People

The risk presented to human life by floodwater varies depending on its depth. Aside from the threat of drowning, a number of circumstances contribute to flood deaths, including: imminent health issues (e.g., heart attack, stroke) prompted by exertion; electrocution; fires; and secondary hazards like gas leaks. Direct deaths are those attributable to the direct effects of winds, floods, and storm surges, while indirect deaths are those attributable to hurricane-related accidents (e.g., auto accidents, sanitation issues). The human death toll from Hurricane Katrina is still debated, but the number of deaths resulting directly from the storm in Orleans Parish as of February 2006 was 1,101. More than 200 indirect deaths in Orleans Parish were reported, and the death toll for the Gulf Coast as a whole was 1,836.

Floodwater is typically highly unsanitary, and that which is inundated (e.g., carpets, furniture) should almost always be disposed of. Secondly, mildew and mold remain even after the water on an inundated surface or object has dried, thus contributing to health issues. Lastly, the psychological impact of experiencing and surviving a flood event can be dire; the resulting stress may lead to serious mental health issues.

2.1.6 Property Damage

The extent of damages caused to property by flooding varies according to the depth and duration of flooding.

Flood-insured damages in the state of Louisiana following Hurricanes Katrina and Rita alone totaled nearly $13 billion. More than half the state's damages reported were in Orleans Parish, where flood-insured damages exceeded $7 billion.

The most common type of damage inflicted by a flood in New Orleans is caused by soaking. When soaked, many materials change their composition or shape. Wet wood will swell and, if dried too quickly, will crack, split or warp. Flooring comes unglued and warps.

Sediment damage to Lafitte Village

Plywood can delaminate. Gypsum wallboard and wooden particle board will fall apart if it is bumped before it dries out. Nails that have been submerged in salt water for a long period of time can become corroded. In the long run, this could compromise the integrity of the nails. Wooden furniture may become so badly warped that it cannot be used. Other furnishings such as upholstery, carpeting, mattresses, and books usually are not worth drying out and restoring. The longer these materials are wet, the more moisture, sediment and pollutants they will absorb.

As evidenced in photos, sediment damage, water damage and warping were all experienced at UNO during Hurricane Katrina

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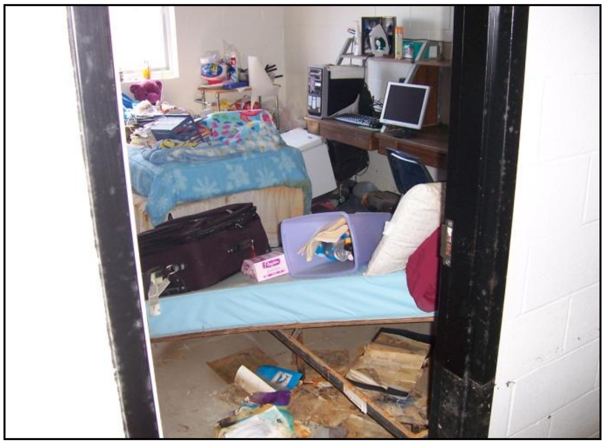


Water damage, Bienville Hall student room

Water damage, Facilities Service office

Floor tile damage, The Cove

Warped cabinets, Bienville Hall

2.2 WIND

2.2.1 Description

High wind hazards are caused by a number of phenomena, including thunderstorms, tropical storms, hurricanes, and tornadoes.

Thunderstorms:

Thunderstorms create downbursts and microbursts, which are strong, concentrated, straight-line winds created by falling rain and sinking air. These storms are of a rapid-onset nature and can reach speeds of 125 mph. Thunderstorms can occur anywhere on campus. There have been 133 occurrences in Orleans Parish since 1950 but not all of them affected campus. Parishwide, property damage exceeded $1.25 million (Appendix A).

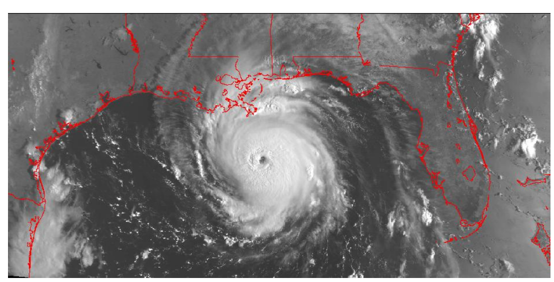
Tropical Storms and Hurricanes:

Tropical storms and hurricanes are large-scale systems of severe thunderstorms that develop over tropical or subtropical waters and have a defined circulation. Also, tropical storms and hurricanes have the potential to produce thunderstorms and tornadoes. Hurricane season runs from June 1 until November 30; however, isolated storms can occur outside of these dates. Storms that affect the Gulf region are the ones that form over the Atlantic Ocean, moving from east to west.

Saffir-Simpson Scale

Type	Category	Winds (mph)
Depression	TD	< 39
Tropical Storm	TS	39-73
Hurricane	1	74-95
Hurricane	2	96-110
Hurricane	3	111-130
Hurricane	4	131-155
Hurricane	5	>155

Tropical storms and hurricanes are measured by their respective wind speeds, as is measured according to the Saffir-Simpson Scale. The highest wind speed recorded in Orleans Parish was 125 mph during Hurricane Camille in 1969.



Hurricane Andrew Approaching Louisiana

Source: LSU Coastal Studies Institute

Tornadoes:

Tornadoes are rotating funnels of air

extending from storm clouds to the ground; their magnitude is measured according to the Enhanced Fujita Scale. Their size and scope vary; wind speeds that accompany tornadoes range from 40 mph up to more than 300 mph. Tornadoes are created during severe weather events like thunderstorms and hurricanes. For instance, Hurricane Gustav (September 2008) is known to have produced 41 tornadoes, 11 of which occurred in Louisiana.

Tornadoes are more likely to occur during the summer and fall months; however, they can occur at any time of day during any season. Louisiana's location renders the state more prone to tornado activity than are the peripheral sides of the country because of the recurrent collision of different weather fronts. The strength and wind speeds of tornadoes are measured on the Enhanced Fujita Scale. Tornadoes that strike water bodies, such as Lake Pontchartrain, are called waterspouts. Waterspouts can move onto land, becoming tornadoes, and the campus' location makes it susceptible to this type of event.

Table 2.2 Enhanced Fujita Tornado Measurement Scale and Occurrences in Louisiana 1950-2010

Source: LOEP Hazard Profile

Category	Wind Speed	Examples of Possible Damage	Number in Louisiana
F0	Gale (40-72 mph)	Light damage. Some damage to chimneys; break branches off trees; push over shallow-rooted trees; damage to sign boards.	322
F1	Moderate (73-112 mph)	Moderate damage. Surface peeled off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off roads.	698
F2	Significant (113-157 mph)	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.	295
F3	Severe (158-206 mph)	Severe damage. Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; cars lifted off ground and thrown.	132
F4	Devastating (207-260 mph)	Devastating damage. Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.	18
F5	Incredible (261-318 mph)	Incredible damage. Strong frame houses lifted off foundations and carried considerable distance to disintegrate; automobile-sized missiles fly through the air in excess of 100-yards; trees debarked; incredible phenomena will occur.	2
Total tornadoes in Louisiana, 1950-2010			1,468

2.2.2 Area Affected

Thunderstorms, tropical storms, and hurricanes vary in scale, but can be so vast in scale that they can affect all areas of southeast Louisiana, including UNO's campus.

Tropical storms and hurricanes gain their energy crossing over warm waters, and they lose strength as their systems pass over land. However, because of the New Orleans metropolitan region's close proximity to the Gulf of Mexico, there is little time for the storms to weaken before reaching the area.

Because of the recurrent collision of different weather fronts in the state of Louisiana, the central and northern parts of the state are more likely to experience tornadoes than are the southern areas of the state. However, no place is really safe from tornadoes outside of mountainous areas.

All University locations are subject to thunderstorms, tropical storms, hurricanes, and tornadoes.

Table 2.3

Historical Average Wind Speeds

Name	**Year**	**Tropical Storm**	**Hurricane Category**				
			1	**2**	**3**	**4**	**5**
Audrey	1957	60	78	88		120	
Betsy	1965	40	70	93	105	120	
Camille	1969						190
Edith	1971	69		98			
Fern	1971						
Carmen	1974	52	86		121	150	
Babe	1977	57	75				
Debra	1978	57					
Bob	1979	46	75				
Claudette	1979	52					
Chris	1982	58					
Danny	1985	52	85				
Elena	1985	56			115		
Juan	1985	65	77				
Not Named	1987						
Beryl	1988	49					
Florence	1988	69	81				
Andrew	1992	57	92			132	
Danny	1997	63	78				
Hermine	1998	42					
Alison	2001	60					
Isidore	2002	60					
Lili	2002	60					
Bill	2003	50					
Ivan	2004					165	
Matthew	2004	40					
Cindy	2005		75				
Dennis	2005					150	
Katrina	2005					175	
Gustav	2008					155	

Source: State Hazard Profile and Unisys Weather

2.2.3 Historical Occurrences

Thunderstorms/High Winds

According to the National Climatic Data Center, between 1950 and late 2010, Orleans Parish has had 132 instances of thunderstorms and high winds, resulting in $1,265,000 in property damage. Most recently during this update process, a November 2010 storm caused more than $50,000 of property damage in the nearby Gentilly neighborhood. However, during this storm, there was no significant damage on campus. Thunderstorms hit campus regularly, especially in the summer months; however, the impact on campus has not been significant.

Tropical Storms and Hurricanes:

The National Climatic Data Center reports that, between 1995 and September 2005, Orleans Parish has experienced 16 hurricanes and tropical storms. The resulting property damage totaled $17,396,000,000. Only five hurricanes categorized at 4 or above have made landfall in Louisiana since 1900: unnamed hurricanes in 1909 and 1915; Hurricane Audrey in 1957; Hurricane Camille in 1969 (the only category 5 hurricane to hit the state since the 1850s); and Hurricane Katrina in 2005. Hurricanes and tropical storms not passing through the area also can affect the area. Hurricane Ike and Hurricane Gustav in September 2008 triggered class cancellations, with Gustav triggering a mandatory evacuation of the city and preparedness actions to be undertaken at UNO.

Tornadoes:

The history of tornadoes from 1953 to 2010 shows that the state of Louisiana averages 27 tornadoes per year (Table 2.4). Since 1975, the state has averaged more than 30 tornadoes per year. The majority of these have ranked as an F0 or an F1 on the Enhanced Fujita Scale. Over the past 40 years, Louisiana has had six tornado-related federal disaster declarations; the most recent instances occurred in November of 2004, February of 2006, February of 2007 and July 2010.

Table 2.4
Tornadoes in Orleans Parish

Date	Time	Mag	Dth	Inj	Damage
11/01/1951	0700	F1	0	0	$25,000
07/17/1953	1120	F2	0	2	$250,000
06/27/1957	0600	F0	0	0	$25,000
07/13/1957	1250	F0	0	0	$3,000
03/31/1962	0700	F1	0	0	$3,000
10/03/1964	0900	F2	0	2	$2,500,000
03/10/1971	0200	F2	0	0	$2,500,000
12/06/1971	1330	F1	0	0	$25,000
07/29/1977	1150	F1	0	3	$25,000
06/22/1981	1345	F2	0	0	$25,000
04/19/1991	1330	F1	0	0	$25,000
08/10/2000	1612	F0	0	0	0
06/30/2003	1145	F0	0	0	$5,000
02/02/2006	0242	F2	0	0	$500,000
02/13/2007	0303	F2	0	15	$2,000,000
02/13/2007	0310	F2	1	10	$1,000,000
07/06/2010	0844	F0	0	0	$10,000

Source: National Climatic Data Center

The National Climatic Data Center reports that, between 1950 and 2010, Orleans Parish has experienced 17 tornadoes, causing $8.92 million in property damage. None of these tornadoes was greater than an estimated F2. Recent occurrences include an estimated F0 in July 2010 and an estimated F2 in February 2010, both in the nearby Gentilly neighborhood. The 2007 event occurred in the middle of the night and caused one death and 10 injuries. No tornadoes have been reported to have directly touched down on campus.

2.2.4 Frequency

During the years 1950 through 2011, there have been 133 instances of thunderstorms and high winds in Orleans.

Frequency: 2.18.

In Orleans Parish, there have been 17 tornado events over the past 60 years; fortunately, these tornadoes have only affected a relatively small area.

Frequency: 0.28.

Frequencies for hurricanes (Categories 1-5) were calculated by the US Geological Survey for hurricanes passing within 80 miles of Orleans Parish (Table 2.5). The National Weather Service keeps a log of historic storms since the 1850s. A total of 126 tropical storms or hurricanes have made landfall in Louisiana since 1850 (Table 2.6).

Frequency, Tropical Storm, 0.40, or every 2.5 years.
Frequency, Category 1: 0.13, or every 8 years
Frequency, Category 2: 0.05, or every 19 years
Frequency, Category 3: 0.03, or every 32 years
Frequency, Category 4: 0.01, or every 70 years
Frequency, Category 5: 0.006, or every 180 years

Table 2.5

Frequency of Hurricanes Passing Within 80 Miles of New Orleans

Intensity	Occurrences	Frequency
Category 1	8 years	0.13
Category 2	19 years	0.05
Category 3	32 years	0.03
Category 4	70 years	0.01
Category 5	180 years	0.006

Source: USGS, "Environmental Atlas of Lake Pontchartrain," in LOEP Hazard Profiles

Table 2.6
Louisiana Storm History

Decade	Hurricanes	T.S.s	Total
1850s	3	1	4
1860s	7	2	9
1870s	6	3	9
1880s	7	3	10
1890s	3	6	9
1900s	2	7	9
1910s	3	2	5
1920s	3	2	5
1930s	2	8	10
1940s	3	9	12
1950s	2	7	9
1960s	4	1	5
1970s	4	3	7
1980s	4	5	9
1990s	3	2	5
2000s	6	6	12
Totals	62	64	126

Source: National Weather Service

2.2.5 Threat to People

Storm tracking technology enhances our ability to predict the occurrence of events like thunderstorms, tropical storms, and hurricanes, thus enabling people to take precautions against the threat that these hazards may pose.

Nine out of 10 deaths during hurricanes are caused by storm surge flooding. High winds from thunderstorms and tropical storms are more likely to cause injuries than fatalities, mainly due to falling tree limbs and airborne debris.

While most tornadoes in Louisiana and in the New Orleans region have been relatively minor, there have been disastrous ones to hit the state. Between 1990 and 2011, tornadoes across the state resulted in 27 deaths and more than 600 injuries. Most deaths caused by tornadoes occur indoors.

Table 2.7

Wind Pressures

Wind speed	Pressure
25 mph	2 lbs/ft^2
75 mph	50 lbs/ft^2
125 mph	1,250 lbs/ft^2

Pressure is measured in pounds per square foot

High winds themselves may pose a risk to humans (Table 2.7). Downed trees and damaged buildings are a potential hazard due to instability, electrical system damage, broken pipelines, and chemical and gas leaks.

2.2.6 Property Damage

Structures can be damaged by high winds in three ways: wind forces, flying debris, and pressure. Wind forces have the potential to down trees, break tree limbs, and destroy loose items such as power lines. As winds increase, so does the pressure against stationary objects. Pressure against a wall rises with the square of the wind speed. The potential for damage to structures is increased when debris breaks the building envelope and allows the wind pressures to impact all surfaces.

Roof damage on Kiefer Lakefront Arena on the UNO campus

More recently, Hurricanes Katrina (2005) and Gustav (2008) have resulted in considerable damage to the University's campuses, the former making landfall as a strong Category 3 storm on the Saffir-Simpson scale (Table 2.8), and the latter making landfall as a Category 2 storm. Damages from Hurricane Katrina topped \$100 million, with \$83 million of damage done to property and another \$17 million in contents damages.

Broken windows, roof damage, rain damage and damage from projectiles, including composite roof parts, characterized the damage. Wind also damaged landscaping. The first and second floor of the Earl K. Long Library was damaged in Hurricane Gustav with winds causing ceiling tiles to fail and rain to enter the structure. Damages totaling $118,000 are currently under repair.

During the tornadoes that occurred in the New Orleans region in February 2006, many structures in the Lakefront neighborhood that had been damaged during Hurricane Katrina were decimated, just four miles from campus. An F2 tornado that occurred on February 13, 2007, affected Orleans Parish and resulted in $2 million in damage. In Orleans Parish, 32 houses were destroyed and 295 others were damaged.

Table 2.8

Saffir-Simpson Scales of Wind Damage

Name	Wind speed	Expected Property Damage
Strong gale	47-54 mph	Chimneys blown down, slate tiles torn from roofs
Whole gale	55-63 mph	Trees broken or uprooted
Storm	64-75 mph	Trees Uprooted, cars overturned
Category 1 Hurricane	74-95 mph	Minimal: Damage is done primarily to shrubbery and trees, unanchored mobile homes are damaged, some signs are damaged, no real damage is done to structures.
Category 2 Hurricane	96-110 mph	Moderate: Some trees are toppled, some roof coverings are damaged, major damage is done to mobile homes.
Category 3 Hurricane	111-130 mph	Extensive: Large trees are toppled, some structural damage is done to roofs, mobile homes are destroyed, structural damage is done to small homes and utility buildings.
Category 4 Hurricane	131-155 mph	Extreme: Extensive damage is done to roofs, windows, and doors; roof systems on small buildings completely fail; some curtain walls fail.
Category 5 Hurricane	>155 mph	Catastrophic: Roof damage is considerable and widespread, window and door damage is severe, there are extensive glass failures, and entire buildings could fail.

2.3 HAIL

2.3.1 Description

Other than flooding and tornadoes, a major threat from strong storms to the University of New Orleans is hail. Hailstones are ice crystals that form within severe thunderstorms when extreme temperature differences from the ground upward produce strong updraft winds that cause ice formation. High velocity updraft winds keep hail in suspension in thunderclouds. Frozen droplets gradually accumulate on the ice crystals until, having amassed sufficient weight, they fall as precipitation.

The severity of hailstorms depends on the size of hailstones, the duration of the storm, and the extent to which the storm affects developed areas. Hailstorms generally occur more frequently during the late spring and early summer, which is a period of extreme variation between ground surface temperatures and jet stream temperatures. The hotter the Earth's surface, the stronger the updraft will be. Higher temperatures relative to elevation result in increased suspension time, allowing hailstones to grow in size.

Table 2.9
Historic Hail Events in New Orleans

Date	Size of hail (inches)
2/5/1962	1.75
4/26/1964	1.75
3/30/1972	1.75
6/17/1973	0.75
9/1/1974	1
5/7/1975	1.5
7/1/1977	1.75
4/18/1980	1
4/26/1982	1.75
7/5/1984	0.75
5/21/1985	0.75
3/2/1991	0.75
4/9/1991	1
2/17/1992	1
6/4/1992	0.75
4/10/1995	1.75
10/27/1995	1.75
4/14/1996	0.75
7/28/1996	0.75
1/24/1997	0.88
3/29/1997	1.5
1/23/2000	0.75
6/21/1998	0.75
1/23/2000	1
6/21/2001	0.88
5/30/2002	0.75
2/4/2004	1.75
7/8/2004	0.75

Source: National Climatic Data Center

2.3.2 Area Affected

Because hail accompanies thunderstorms, The University of New Orleans campuses are at risk for hailstorms.

2.3.3 Historical Occurrences

The state of Louisiana experienced more than 4,600 hailstorms between 1962 and 2010; the maximum recorded hailstone size is that of a softball (which is roughly 4.5 inches in diameter). Since 1962, Orleans Parish has experienced 28 hailstorms with hail of at least 0.75 inches in diameter. This includes hail events with golf-ball-sized hail (which is roughly 1.75 inches in diameter) on seven separate occasions. This is the largest size hail that has been experienced on campus, and most hail events do not have hailstones of this size.

2.3.4 Frequency

The University of New Orleans is likely to experience several strong storms each year, with the greatest risk coming in the summer months. Between 1962 and 2010, there have been 28 hail events in Orleans Parish.

Frequency: 0.57

2.3.5 Threat to People

Hailstorms rarely result in human fatalities, although large hailstones can cause bodily injury. There have been no fatalities or serious injuries listed in Orleans Parish due to hail.

2.3.6 Property Damage

Hailstorms may result in damage to property (e.g., homes and automobiles), as well as damage to crops. Small hail (which measures 0.25 to 0.5 inches) usually does minimal damage to property. Large hail (which measures 0.75 inches or greater) can cause damage to building roofs and exterior walls. It can also cause significant damage to automobiles. Furthermore, hail can lead to leaks in roofs, which can result in water damage inside buildings.

Windows and cars are especially vulnerable to hail damage.

All buildings are vulnerable to hail damage in times of severe weather. Also, any automobile or other uncovered property is at risk for hail damage. Buildings with older roofs are more prone to this kind of damage. However, because the age of a roof does not necessarily correlate to the age of its building, it is impossible to say that older buildings are necessarily at greater risk than newer ones.

No property damage resulting from hailstorms has been reported at The University of New Orleans.

2.4 LIGHTNING

2.4.1 Description

Lightning typically occurs as a by-product of thunderstorms. The action of rising and descending air in a thunderstorm separates positive and negative charges, with lightning resulting from the buildup and discharge of the energy between positive and negative charge areas.

Table 2.10: Lightning Activity Level

LAL	Cloud and Storm Development	Lightning strikes/min.
1	No thunderstorms	N/A
2	Cumulus Clouds are common but only a dew reach the towering cumulus stage. A single thunderstorm must be confirmed in the observation area. The clouds produce mainly virga, but light rain will occasionally reach the ground. Lightning is very infrequent.	1 to 8
3	Towering cumulus covers less than 2/10 of the sky. Thunderstorms are few, but two or three must occur within the observation area. Light to moderate rain will reach the ground, and lightning infrequent.	9 to 15
4	Towering cumulus covers 2/10 to 3/10 of the ski. Thunderstorms are scattered and more than three must occur within the observation area. Moderate rain is common and lightning is frequent.	16 to 25
5	Towering cumulus and thunderstorms are numerous. They cover more than 3/10 and occasionally obscure the sky. Rain is moderate to heavy and lightning is frequent and intense.	More than 25
6	Similar to LAL 3, except thunderstorms are dry.	9 to 15

Source: National Oceanic and Atmospheric Administration

2.4.2 Area Affected

Because lightning is a function of thunderstorms, every person and building on the University of New Orleans campuses is vulnerable to a lightning strike. According to the state hazard mitigation plan, those Louisiana parishes adjacent to Lake Pontchartrain seem to experience a higher number of flashes per square mile than do other parishes. All areas of campus can experience lightning at any level indicated by the above chart.

2.4.3 Historical Occurrences

The state of Louisiana is second in the nation in terms of flash density, which measures the annual number of lightning flashes per square kilometer. Louisiana ranks tenth in the nation in terms of lightning-related fatalities, when factoring in population.

Table 2.11: Historic Lightning Events in New Orleans

Date	Deaths	Injuries	Damage
6/17/1994	0	0	$50,000
5/30/1995	0	2	$0
4/14/1996	0	0	$0
4/17/1996	1	0	$0
6/21/1998	0	0	$120,000
9/6/1999	0	0	$50,000
6/4/2000	2	0	$0
5/30/2005	0	0	$0
6/6/2005	0	0	$0
6/4/2007	0	0	$50,000

Source: National Climatic Data Center

Since 1994, Orleans Parish has experienced 10 lightning events. In May 2002, a lightning strike caused a fire that resulted in $91,725 in property damage to the UNO Lakefront Arena marquee on East Campus. In August 2002, lightning caused $8,475.89 in damage to the university alumni center construction site on the main campus. In September 2002, $1,425 in damage was caused by lightning to the phone lines that service the pay parking lot computers on the main campus. In May 2004, a lightning strike caused a fire that resulted in $275,000 in damage to the Privateer Park scoreboard located on our East campus. No additional strikes have been reported during this update period.

The Louisiana Office of Risk Management has made claims on behalf of The University of New Orleans worth $35,186.38.[4]

2.4.4 Frequency

Regarding lightning strikes that are severe enough to warrant record, Orleans Parish experienced 10 such events between 1994 and 2010.
Frequency: 0.59.

2.4.5 Threat to People

Lightning strikes kill more people than do tornadoes. Statistics show that, on average, lightning hazards result in injury or death 50 percent of the time. Most lightning fatalities and injuries occur outdoors at recreation events and under or near trees. Nationwide, it is estimated that 25 million cloud-to-ground lightning flashes occur each year, and that

52 people are killed and 1,000 are injured. Most of these deaths can be prevented through safe practices. Much information has come out over the last 20 years regarding lightning safety. For example, before 1990, on average, 89 people were killed each year by lightning; by 2000, this number had dropped to 52.

A UNO student was killed by lightning while on the University's main campus in 1990 and three other students were knocked to the ground by the lightning strike. Those three students were treated at the university's student health center and did not sustain major injuries.

Lightning strikes resulted in one death in New Orleans in 1996, as well as two deaths in the city in 2000.5

2.4.6 Property Damage

Lightning can cause direct damage to property. A major concern is damage to critical infrastructure. Since 1994, lightning strikes have resulted in $270,000 in property damage in Orleans Parish.

In May 2002, a lightning strike caused a fire that resulted in $91,725 in property damage to the UNO Lakefront Arena marquee. In August 2002, lightning caused $8,475.89 in damage to a university alumni center construction site on the main campus. In September 2002, $1,425 in damage was caused by lightning to the phone lines that service the pay parking lot computers on the main campus. In May 2004, a lightning strike caused a fire that resulted in $275,000 in damage to the Privateer Park scoreboard located on our East campus.

The Louisiana Office of Risk Management has made claims on behalf of The University of New Orleans worth $35,186.38.[4]

2.5. STORM SURGE

2.5.1 Description

Storm surge events occur when water is pushed toward the shoreline by winds swirling around a tropical event such as tropical storms or hurricanes. This push of water

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[4] Louisiana Office of Risk Management

combines with the normal tide levels to create storm surge, which can increase the water level by at least 15 feet[5].

When wind-driven waves overtop the storm tide, the rise in water level can cause severe flooding in coastal areas. This affects much of the United States' densely populated Atlantic and Gulf Coast coastlines because they largely lie less than ten feet above mean sea level.

High water mark in Bienville Hall after Hurricanes Katrina and Rita in 2005

Source: University of Nebraska

2.5.2 Area Affected

Since The University of New Orleans borders Lake Pontchartrain, it is exposed to the possibility of storm surge. Although levees along the Main and East campuses are designed to protect the campuses from storm surge, levee failure, overtopping or breaching could result in a significant storm surge event, of as many as 10 feet across both campuses. Such an event would have significant impacts on campus.

Lakeshore Drive is outside the levee system in many areas and has been closed from time-to-time due to storm surge, including in 2008 during Hurricanes Gustav and Ike. While this does not affect the campus, it does have the potential to impact ingress and egress to the campus along Lakeshore Drive.

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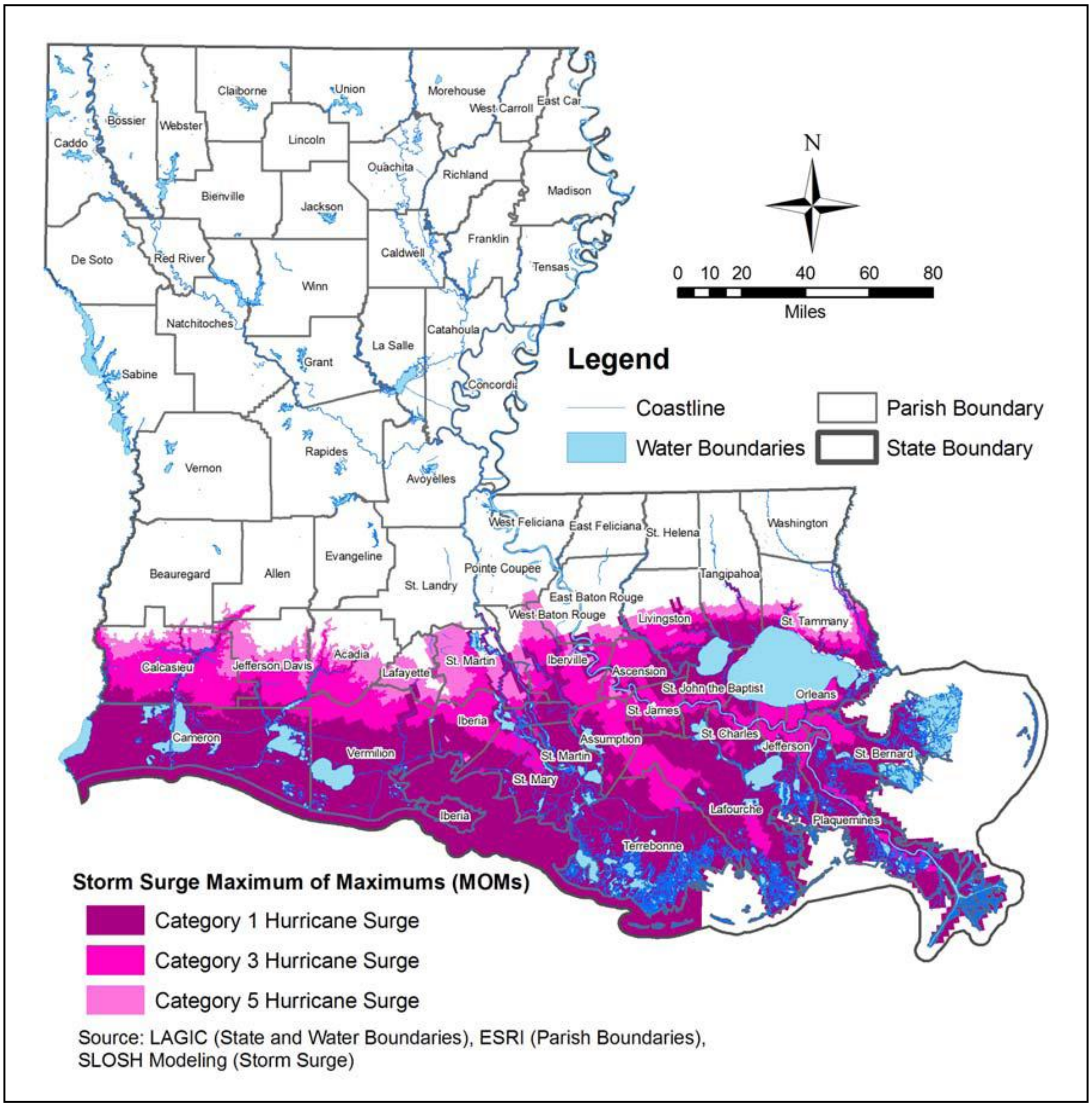
[5]National Oceanic and Atmospheric Administration, National Hurricane Center. "Storm Surge." Last accessed on 23 July 23, 2010 at <http://www.nhc.noaa.gov/HAW2/english/storm_surge.shtml>.

Storm Surge Maximum Outputs



2.5.3 Historical Occurrences

Storm surge resulting from hurricanes and other severe storms is responsible for most coastal flooding and coastal erosion along the Louisiana Gulf Coast. Storm surge can also impact areas that are further inland, including lakes and rivers. Storm surge in Jefferson and Orleans Parishes is primarily the result of hurricanes that approach land from the Gulf of Mexico. While storm surge is most likely to impact the southern portion of Jefferson Parish, the northern part is vulnerable to storm surge from Lake Pontchartrain. Orleans Parish is vulnerable to storm surges from Lake Pontchartrain as well as Lake Borgne via the Mississippi River Gulf Outlet shipping channel.

The National Hurricane Center estimates storm surge heights based on pressure, size, forward speed, tracks, and the radius of maximum winds. These estimates are produced utilizing SLOSH (Sea, Lake and Overland Surges from Hurricanes) modeling. The map found on the next page is a result of the current SLOSH models available for southern Louisiana. The map indicates the areas that may be impacted by storm surge due to hurricanes. Please note that the map represents not just one single event but the cumulative storm surges for hundreds of modeled hypothetical hurricane tracks.

Hence, all UNO buildings are vulnerable to the storm surge hazard.

Table 2.12
Storm Surge Events - Orleans Parish

Location or County	Date	Type	Death	Injuries	Property Damage
Chef Menteur	2/15/1998	Storm Surge	0	0	0
Countywide	9/12/1998	Storm Surge	0	0	0
LAZ038 - 040 - 058 - 060>063 - 066>070	6/30/2003	Storm Surge	0	0	4.1M
LAZ040 - 058 - 060>062 - 066>070	9/15/2004	Storm Surge	0	0	4.0M
LAZ038 - 040 - 050 - 058 - 060>062 - 066>070	10/9/2004	Storm Surge	0	0	100K
LAZ061>062 - 064 - 067>070	7/5/2005	Storm Surge	0	0	2.5M
LAZ040 - 059 - 061>064 - 067>070	8/29/2005	Storm Surge	0	0	31.3B
LAZ038 - 040 - 050 - 058>070	9/23/2005	Storm Surge	0	0	432.0M
LAZ038 - 040 - 049 - 057>058 - 060 - 062 - 066	9/11/2008	Storm Surge/tide	0	0	0

Source: NOAA - NCDC

2.5.4 Frequency

Based on the data provided by the National Climatic Data Center for the period 1998-2010, the frequency for this hazard is as follows:

Frequency: 0.90

2.5.5 Threat to People

If storm surge was likely to affect campus, a mandatory evacuation order would likely be in effect, making the threat to people minimal, since the campus would be unoccupied.

2.5.6 Property Damage

If a major storm or a major levee breach during a small storm were to occur, the damage to property could be significant. With the possibility of a 10-foot surge, the first floors of many campus buildings would be significantly damaged. Damage from floating debris could also pose a threat to property.

2.6 WINTER STORMS

2.6.1 Description

Winter storms can take the form of heavy snowfalls, ice storms, or extreme cold temperatures. Winter storms can occur as a single event, or they can occur in combinations, which can make the events more severe. Severe winter weather consists of freezing temperatures and heavy precipitation, usually in the form of rain, freezing rain, or sleet, and sometimes in the forms of snow. For example, a moderate snowfall could create severe conditions if it were followed by freezing rain and subsequent extremely cold temperatures.

An ice storm occurs when freezing rain falls from clouds and freezes immediately upon impact. Freezing rain is found in between sleet and rain. It occurs when the precipitation falls into a large layer of warm air and does not have time to refreeze in a cold layer (at or below 32 degrees Fahrenheit) before it comes in contact with the surface which is also at or below freezing.

UNO during 2008 snowfall

2.6.2 Area Affected

Despite the region's mild winters, all of the University of New Orleans campuses are subject to the effects of winter storms.

2.6.3 Historical Occurrences

Louisiana has, in recent history, experienced a number of ice storms, primarily affecting the northern part of the state. Storms in February 1994 resulted in widespread power outages and over $13,000,000 in damage. Storms in December 2000 effected a presidential disaster declaration.

Winter months in Louisiana are generally warmer than most parts of the continental United States, and thus New Orleans is rarely affected by winter storms. The average daily high temperature in January is 62 degrees Fahrenheit, and the average daily low temperature for the month of January is 43 degrees Fahrenheit. Only two winter storms have hit since 1950. Snow fell on December 25, 2004, as well as on December 11, 2008 (the only event reported since the original Mitigation Plan was adopted). The December 2004 event, which occurred during the winter break for students and holiday break for faculty and staff, included a mix of sleet and snow accumulating to one-half inch, elevated roadways iced over contributing to a high number of traffic accidents and closure of the airport. In 2008, there snow showers continued for a few hours, and accumulation was less than a quarter of an inch. There were no significant effects on campus. This is the only snow and ice event to be recorded in the University's history.

The last major freeze occurred in 1989, when temperatures dropped below freezing for 64 consecutive hours; the lowest temperature recorded during that cold spell was 11 degrees Fahrenheit. The greatest measurable snowfall occurred in the region in 1963, when up to 3 inches fell.

None of these events caused property damage or injuries or affected University operations.

2.6.4 Frequency

According to the National Climatic Data Center, the entire state of Louisiana is in the lowest category of probable snow depth - 0 to 10 inches of snow depth with a 5 percent chance of being equaled or exceeded in any given year. However, Southeastern Louisiana is less susceptible to extreme cold conditions. Moreover, cold spells experienced in the state seldom endure longer than one week.[6]

An average high of 82.7 degrees Fahrenheit in July to an average low of 52.6 degrees is found in Orleans Parish.

The only federally declared snow and ice event in Orleans Parish, according to the NCDC, was the 2004 event, and the event did not result in deaths, injuries or damage in the City or on campus.

Frequency: 0.05.

2.6.5 Threat to People

Winter storms can cause injury or death to people. Extreme cold can result in people and animals suffering from hypothermia and frostbite. Hypothermia is a condition whereby the core body temperature is lowered below 95 degrees Fahrenheit; severe hypothermia is a condition whereby the core body temperature is lowered below 85 degrees Fahrenheit, resulting in unconsciousness (and subsequently death, if left untreated).

People are most at-risk from cold temperatures, downed power lines due to falling tree limbs, and unsafe driving conditions. Winter storms bring hazardous driving and walking conditions; even small accumulations of ice can be dangerous to motorists and pedestrians. Bridges and overpasses are particularly dangerous because they freeze faster than other surfaces. Roughly 70 percent of the injuries caused by the effects of winter storms result from vehicle accidents, and 25 percent of injuries to people occur when they are caught outdoors during a storm. The ice storms that hit Louisiana in December 2000 resulted in one fatality.

Injuries Related to Cold

– 50% happen to people over 60 years old
– More than 75% happen to males
– About 20% happen at home

Two deaths from hypothermia resulted from extreme cold temperatures recorded in Orleans Parish in January 2008.

Additionally, the exertion brought on by shoveling can potentially lead to a heart attack.

2.6.6 Property Damage

Property damage can occur from falling trees and broken water pipes. Most damage from winter storms results from broken or frozen water pipes, as is evidenced by the winter storm that hit the region in 1989. There have been no reports of significant damage or injuries at the University as a result of past winter storms.

2.7 SUBSIDENCE

2.7.1 Description

Subsidence refers to the gradual settling or sinking of the Earth's surface due to removal or movement of subsurface earth materials. Some principal causes of subsidence are compaction, underground mining, and removal of groundwater. In coastal Louisiana, large amounts of sediment were being deposited by the Mississippi River in a relatively short amount of time, causing the crust to compensate for the extra weight of the sediment.

Geology and soil types do not have much effect on subsidence rates. Other causes like human occupancy, buildings and infrastructure, oil and gas extraction, and lowering of the water table due to groundwater extraction have much more of an effect. Human acceleration of natural processes through leveeing rivers, draining wetlands, dredging channels, and cutting canals through marshes exacerbates the subsidence problem.

Relative sea level rise is a term that describes the combined effects of eutrophic (ocean-wide) sea-level rise and land subsidence. Both of these geologic processes impact Louisiana in a similar manner, making it difficult to separate the effects of one from the other. The most prominent cause of sea-level rise is the melting of the Earth's glacial ice caps.

Because it is difficult to separate the effects of subsidence and sea-level rise, a new approach to categorizing the hazard has been developed. A coastal vulnerability index (CVI) is determined based on rate of sea-level rise, coastal erosion, wave height, tidal characteristics, regional coastal slope, and coastal geomorphology. The CVI for the Louisiana coast is high to very high. Some portions rank very high for every factor with the exception of wave height. The main factors responsible for the high ranking, however, are geomorphology, coastal slope, and rate of relative sea-level rise.

The US Geological Survey estimates that the rate of sea-level rise in Louisiana is approximately 3.0 feet/century and the US EPA estimates that it is approximately 3.4 feet/century. There is little to suggest that these processes will cease to occur in the future, indeed rates may increase due to the naturally occurring sediment deposition. The highest rate of subsidence is occurring at the Mississippi River delta (3.5 feet/century). Subsidence rates decrease away from the delta in a northeast, northwest, and western direction. A system of subsidence faults in southern Louisiana developed due to the extra weight from rapid sediment deposition from the Mississippi River. The system stretches across the southern portion of the State of Louisiana from Beauregard

Parish in the east to St. Tammany Parish in the west, and includes every Parish to the south of this line.

2.7.2 Area Affected

All UNO campuses are subject to subsidence.

According to the Louisiana Governor's Office of Coastal Protection and Restoration, there 1,829 square miles of Louisiana have been lost since the 1930s. Despite comprising about a third of all marshlands in the conterminous United States, Louisiana marshes account for 90 percent of the loss. Losses range from 13 to 40 square miles per year, but large storm events can cause dramatic losses.

2.7.3 Historical Occurrences

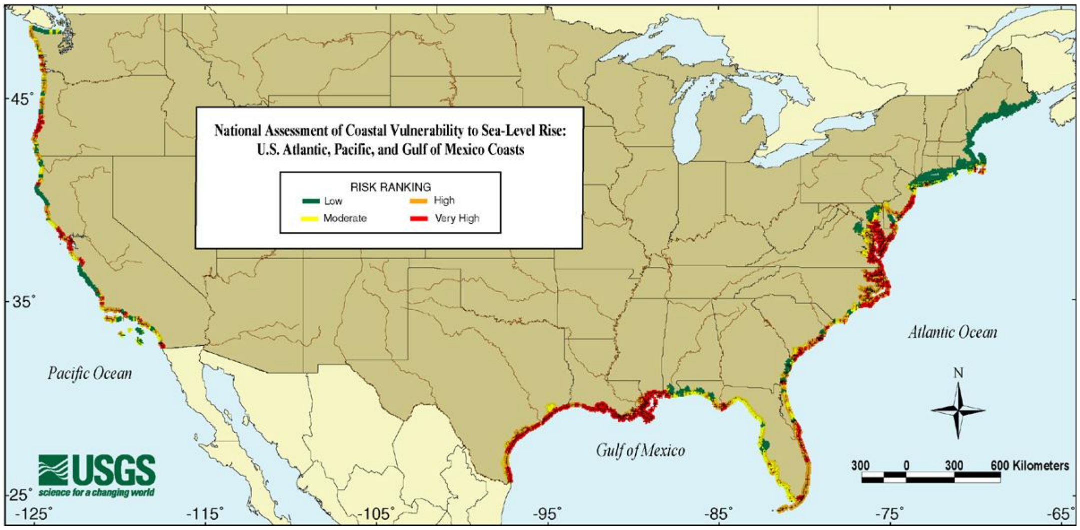
Records show that the level of Lake Pontchartrain rose about 25 centimeters or 10 inches since 1931. There are no single incidents or occurrences of subsidence. It is a process. An acre of land along the coast disappears every 24 minutes.

Sea-level rise and land subsidence are increasingly identified as significant contributors to direct disaster damages in Louisiana, especially the latter. However, because for the most part, sea-level rise and subsidence are two processes that are slow acting, their effects have not been as evident as sudden-occurrence hazards like earthquakes.

2.7.4 Frequency

As noted under historical occurrences, there is no recurrence interval. Subsidence is a constant process, and the effect in Coastal Louisiana is considered very high. The USGS rates subsidence rates according to vulnerability of to Sea Level Rise, and the Southeast Louisiana coast is considered to have the highest vulnerability (Very High), as shown in the map on the next page. Some shoreline loss is accelerated during tropical storms and hurricanes. The frequency for subsidence is continuous.

Frequency: 1.0.



2.7.5 Threat to People

Subsidence does present an immediate threat to life, safety and public health.

2.7.6 Property Damage

Sea level rise and subsidence along the Louisiana coast means that over time, there is less land between developed areas and water. The process means development will be more exposed to damage by storm surge and wetland vegetation will be more subject to saltwater intrusion or submergence.

Table 2.13 Palmer Drought Severity Index (Source: NOAA, National Weather Service - Climate Prediction Center)
-4.0 or less (Extreme Drought)
-3.0 to -3.9 (Severe Drought)
-2.0 to -2.9 (Moderate Drought)
-1.9 to +1.9 (Near Normal)
+2.0 to +2.9 (Unusual Moist Spell)
+3.0 to +3.9 (Very Moist Spell)
+4.0 or above(Extremely Moist)

Land and wetlands act as cushions during tropical storms and hurricanes. Less cushion means storm surges will reach farther inland and levees will have to be raised to maintain flood protection levels.

2.8 DROUGHT

2.8.1 Description

Drought is a period during which precipitation is below average. Its duration and severity are usually measured by deviation from norms of annual precipitation. Episodes of drought are often tied to the El Niño/La Niña cycle. A La Niña period features colder than normal sea surface temperatures in the tropical Pacific Ocean.

There are four classes of drought, based upon what is impacted by the shortage of water:

- *Meteorological Drought*: less precipitation than average or normal amount based on monthly, seasonal, or annual time scales
- *Hydrologic Drought*: less stream flows and reservoir, lake, and groundwater levels
- *Agricultural Drought*: a reduction in soil moisture enough to affect plant life, usually crops
- *Socioeconomic Drought*: a reduction in water supply to the extent that demand exceeds supply

The Palmer Drought Severity Index shown in Table 2.13 serves as indication of relative dryness or wetness and can be applied to any part of the country. Per NOAA, it is the semi-official drought index but is most effective in determining long term drought. It uses a 0 as normal, and shows drought in terms of minus numbers. Excess rain is shown by plus numbers in the Index.

2.8.2 Area Affected

Drought conditions may occur anywhere in the United States. Although the New Orleans region typically has a rainy climate, it has been threatened by drought conditions in the past. All of The University of New Orleans campuses can be affected by drought.

2.8.3 Historical Occurrences

Despite Louisiana's large number of major and lesser bodies of water, the state is still subject to drought conditions. This is especially true in the northern half of the state, where adverse conditions during periods of drought have been known to result in crop damage. Water restrictions that other U.S. residents often face are rarely imposed in the state of Louisiana.

History shows a relationship between southern Louisiana precipitation and the establishment of La Niña weather patterns. La Niña, characterized by unusually cold ocean temperatures in the Pacific, can bring abnormally warm and dry weather conditions to Louisiana. In approximately 80 percent of past significant La Niña occurrences, winter and spring rainfall has been less than average.

This pattern was seen during the last dry spell in the state, which was 1998-2000; over this time span, drought in the state of Louisiana resulted in almost $385,000,000 in crop damage. The year 2000 had the driest winter in over a century.

Table 2.14.
Drought Events for Orleans Parish Per the National Climatic Data Center

Location or County	Date	Death	Injuries	Property Damage	Crop Damage
1 LAZ034>040 - 046>050 - 056>070	07/01/1998	0	0	0	0
2 LAZ034>040 - 046>050 - 056>070	08/01/1998	0	0	0	$77.5 million

Although only two drought events are recorded for Orleans Parish by the National Climatic Data Center (See Table 2.14), drought effects on the Parish have been acknowledged for the following events recorded for nearby Jefferson Parish:

- February 2000 / Southeast Louisiana felt effects of -4.5 rated drought
- October 2005 / -2.25 rated on the Palmer Index
- June 2009 / -1.67 rated on the Palmer Index

During these droughts, there were no significant effects on the people, property or university operations. The only damage in Orleans parish was $77.5 million in crop damage in 1998, according the NCDC.

2.8.4 Frequency

Per the NCDC, between January 1950 and April 2011, Orleans Parish has only been affected by two recognized drought events.

Per FEMA, no federally declared disasters related to drought have occurred in Orleans Parish.

Frequency: 0.03.

2.8.5 Threat to People

Unlike other hazards, drought does not occur quickly. Drought evolves over time as certain conditions are met and are spread over a large geographical area. While these conditions do not kill or injure people outright, they do have serious consequences, including:

- Reduced capacity of hydroelectric power generators
- Reduced stream flows for navigation, recreation, and community water supplies
- Reduced water quality
- Reduced crop production
- Increased fire risk

2.8.6 Property Damage

Drought does not directly damage structures and other human development. It does, however, increase the risk of damage by fire, especially in the urban-wild land interface.

In areas with expansive soils, drought can shrink the soils under foundations. The result may crack walls and floors or even undermine supports. Out of the 250,000 homes built each year on expansive soils, 10 percent sustain significant damage during their useful lives, some beyond repair, and 60 percent sustain minor damage. Similar damage can occur to roads and bridges. Such expansive soils are common in southeast Louisiana.

The effects of expansive soils are most prevalent when prolonged periods of drought are followed by long periods of rainfall. Houses and small buildings are impacted more by expansive soils than larger buildings. Large buildings are not so susceptible because their weight counters pressures from soil swelling. The 2000 drought caused cracks in levees; however, they were not considered threatening to the stability of the levees. The drought also put the foundations of area houses and apartment buildings at risk to cracking.

Drought also can exacerbate subsidence as dry soils are more easily compacted when the water table is lower than normal. When such conditions occur on levees, compaction can reduce the height of protection and lead to weak spots in the levee system. During the 2011 Mississippi River floods, a number of large cracks were discovered due to drought. While it was believed that they posed no large threat, repairs were made to secure the levee system.

Drought conditions have had no significant impact on the University's campus to date. This hazard has a very low probability of significant impacts on the University, and therefore the mitigation strategy refers only to landscaping practices in relation to drought.

2.9 EARTHQUAKES

2.9.1 Description

Earthquakes are one of nature's most damaging hazards. Earthquakes are caused by the release of strain between or within the Earth's tectonic plates. The severity of an earthquake depends on the amount of strain or energy that is released along a fault or at the epicenter of an earthquake, and the type of bedrock that the energy travels through. The energy released by an earthquake is sent to the earth's surface and released.

Earthquakes in Louisiana have had two distinct sources: a system of subsidence faults (also known as "growth faults") in southern Louisiana, and the New Madrid seismic zone to the north of Louisiana. The more severe earthquakes are related to the New Madrid seismic zone to the north of Louisiana.

There are several common measures of earthquakes, including the Richter Scale and the Modified Mercalli Intensity (MMI) scale (Table 2.12). The Richter Scale is a measurement of the magnitude or amount of energy released by an earthquake. Magnitude is measured by seismographs. The Modified Mercalli Intensity is an observed measurement of the earthquake's intensity felt at the earth's surface. The MMI varies, depending on the observer's location in relation to the earthquake's epicenter.

Table 2.15

Earthquake Measurement Scales

Richter	Mercalli	Intensity Felt
0 – 4.3	I	Not felt except by very few people under special conditions. Detected mostly by instruments.
	II	Felt by a few people, especially those on upper floors of buildings. Suspended objects may swing.
	III	Felt noticeably indoors. Standing automobiles may rock slightly.
4.3 – 4.8	IV	Felt by many people indoors, by a few outdoors. At night, some people are awakened. Dishes, windows, and doors rattle.
	V	Felt by nearly everyone. Many people are awakened. Some dishes and windows are broken. Unstable objects are overturned.
4.8 – 6.2	VI	Felt by everyone. Many people become frightened and run outdoors. Some heavy furniture is moved. Some plaster falls.
	VII	Most people are alarmed and run outside. Damage is negligible in buildings of good construction, considerable in buildings of poor construction.
6.2 – 7.3	VIII	Damage is slight in specially designed structures, considerable is ordinary buildings, great in poorly built structures. Heavy furniture is overturned.
	IX	Damage is considerable in specially designed buildings. Buildings shift from their foundations and partly collapse. Underground pipes are broken.
	X	Some well-built wooden structures are destroyed. Most masonry structures are destroyed. The ground is badly cracked. Landslides occur on steep slopes.
7.3 – 8.9	XI	Few, if any, masonry structures remain standing. Rails are bent. Broad fissures appear in the ground.
	XII	Virtually total destruction. Waves are seen on the ground surface. Objects are thrown in the air.

An earthquake’s intensity depends on the geologic make-up of the area and the stability of the underlying soils. The effects of earthquakes can be localized near its epicenter or felt significant distances away. For example, a 6.8-magnitude earthquake in the New Madrid Fault in Missouri would have a much wider impact than a comparable event on the California Coast. The thick sandstone and limestone strata of the central United States behave as “conductors” of the earthquake’s energy, and tremors can be felt hundreds of miles away. By contrast, the geology of the West Coast allows the energy to be dissipated relatively quickly which keeps the effects of the earthquake more localized.

Earthquakes can also trigger other types of ground failures which could contribute to the damage. These include landslides, dam and levee failures, and liquefaction. In the last situation, shaking can mix groundwater and soil, liquefying and weakening the ground that supports buildings and severing utility lines. This is a special problem in floodplains where the water table is relatively high and soils are more susceptible to liquefaction.

2.9.2 Area Affected

If an earthquake were to occur on the campus of the University of New Orleans, the entire University would be affected.

There are no records of earthquakes directly striking the University of New Orleans; however, there have been reports of earthquakes in the surrounding areas.

2.9.3 Historical Occurrences

The earthquake closest to the campuses of The University of New Orleans was on November 6, 1958. This MMI IV earthquake was confined to an area within a five- to seven-mile radius of downtown New Orleans. The assigned MMI IV is based on reports of maximum effects as windows shook and doors rattled.

The largest earthquake to have occurred in Louisiana was centered at Donaldsonville, about 60 miles west of New Orleans on October 19, 1930. Maximum intensity reached MMI IV at Napoleonville. Intensity V effects were noticed at Des Allemands, Donaldsonville, Franklin, Morgan City, and White Castle, where small objects overturned, trees and bushes were shaken, and plaster cracked. The total area that felt the effects of this earthquake was 15,000 square miles.

The famous 1812 New Madrid quake was felt in New Orleans. A repeat of that severe an incident is predicted to produce MMI of III or IV in southern Louisiana. The Louisiana

Geological Survey reports that the “New Madrid seismic zone remains the area most likely to produce earthquakes that could affect Louisiana.”

Most recently, an earthquake occurred in Alaska that resulted in effects being felt at the University of New Orleans’ main campus. Evidence of waves and overflow of water at the UNO pool were the only effects felt on campus.

Two earthquakes have occurred within 200 miles of campus in recent years. On August 2, 2010, a 3.0 magnitude earthquake occurred near Clinton, Louisiana. On February 18, 2011, a 3.5 magnitude earthquake was recorded just offshore from Dauphin Island, Alabama. There were no reported campus observations of these events.

2.9.4 Frequency

Although University buildings lie in an area of low seismic risk, a number of earthquakes have occurred in the State of Louisiana over the last 200 years. Most of these earthquakes were of low magnitude and occurred infrequently. The USGS has recognized three earthquakes occurring in Louisiana since 1973.

Frequency: 0.07.

2.9.5 Threat to People

The single most common cause of death during an earthquake is the collapse of a building. Other threats to people include collapsing roads and bridges, flooding from dam and levee breaches, fires from ruptured gas lines, and release of hazardous chemicals from broken storage tanks or trucks. Small earthquakes such as those typical in Louisiana are unlikely to cause these damages.

2.9.6 Property Damage

All of the earthquakes that occurred in Louisiana since 1843 were of low magnitude, resulting mostly in limited property damage, such as broken windows, damaged chimneys, and cracked plaster.

2.10 TERMITES

2.10.1 Description

Termites are small pale colored insects that live off of wood and wooden structures at or near the ground. These creatures are similar to ants as they both live in colonies, they both have workers that gather and collect food, and they both have a queen that is in charge of the colony. Queen termites can lay upwards of 10,000 eggs per year and the worker termites are responsible for maintaining and caring for these eggs.

Termites tend to live close to the ground and near areas of moisture and sources of food or wood. Their role in nature is to recycle wood. They can cause significant damage to any wooden structure if the conditions are favorable for a termite colony's development.

Formosan Termite

Source: LSU AgCenter

There are two types of termites that live in southeastern Louisiana: drywood termites and subterranean termites. Drywood termites live in the wood that they are ingesting and do not require soil and moisture. Subterranean termites require soil and moisture in order to survive. They will bring the soil and moisture with them into the wood that they are infesting. Mud tubes are created and lead from the colony's home to the infested wood in order to supply the area with moisture and soil.

The Formosan termite is a species of the subterranean termite. Formosans are very aggressive. They have the largest colonies of any termites in North American and can cause extensive damage in a short time. To reach food and water, Formosan termites can chew through materials such as thin sheets of soft metals, rubber, stucco, and seals on water lines.

Signs of subterranean termites

Indoors

- Earthen masses on door frames, edges of walls, floors, ceiling, stairs, skirting or other areas of the house
- Blistering of paint on windows, door frames and skirting
- Damp areas on walls
- Distortion of floor, window or door frames

Outdoors

- Large number of alates (winged termites) either inside or outside the house
- Mud tubes over foundation walls, piers and edges of concrete slabs
- Trees with earthen material near the base and on the bark
- Damaged fences, utility poles and landscaping timbers

Source: LSU AgCenter

2.10.2 Area Affected

The main concentration of termites occurs in southeastern Louisiana. Most of Orleans Parish is affected.

The termite problem is expected to continue to spread.

2.10.3 Historical Occurrences

The Formosan termite was originally introduced into the New Orleans area and other coastal areas just after World War II. By the time it was identified in

1966, the insect was firmly entrenched into the local environment. Because this termite has no natural predators in the area, it is free to breed and spread without control. Termite infestations of structures have been devastating. The national estimates dealing with termite damage has risen from $750 million in 1988, to $2 billion by 1993. The estimate of losses for the state of Louisiana on a yearly basis is around $500 million, with $300 million of this being in the New Orleans area. The University has been affected by termites, particularly in the University Center.

2.10.4 Frequency

The termite threat is a year-round issue. There is an annual peak of swarms between the months of April and June, with the heaviest concentration in May. The number of termites is dependent on the weather that occurs in the spring. Since 1989, there has been an increase in the number of swarms in the New Orleans metro area almost every year between 1989 and 1998. The frequency for damage from termites is on-going and affects every building on campus.

Frequency: 1.00.

2.10.5 Threat to People

The greatest risk to people is safety around and in a structure or object that may have been damaged by a termite infestation. Termites can reduce the load bearing weight of support beams in houses and businesses, putting them at greater risk of having part or all of the structure collapse when force is applied. If termites have weakened a tree or pole, a slight wind could prove to be enough to push the pole over or remove a branch from the tree.

Damage from termites in Children's Center

2.10.6 Property Damage

According to Louisiana State University's Agricultural Center, Formosan termites "can cause major structural damage to a home in six months and almost complete destruction in two years."

Termites, especially Formosan termites, will often infiltrate the building through a weakness in the foundation or at a location where the building comes into contact with soil. There have been recorded instances where a termite infestation has caused a house to split in half.

At The University of New Orleans, all newer buildings are concrete masonry, reducing the opportunity termites have to do damage, but any building with a pitched roof will have damage, and even in brick buildings, termites enter through the vents and do damage to contents inside. They even provide a threat to underground assets, eating the insulation around underground electrical infrastructure.

2.11 EPIDEMICS

2.11.1 Description

Epidemics are outbreaks of disease that affect a disproportionate percentage of the population within a region. They can develop through a variety of mechanisms. In the modern world, international travel and shipping allow pathogens to travel from region to region and country to country easily. An example of a disease being spread by travel is the outbreak of SARS in East Asia and Toronto. Epidemics can also be caused by pathogens transmitted as insects and animals migrate. An example of this type of transmission can be found in the recent outbreak of the West Nile Virus in Louisiana.

The West Nile virus outbreak is one epidemic to have affected the New Orleans metropolitan area in recent years. West Nile fever is usually a mild disease in people, characterized by flu-like symptoms. West Nile fever typically lasts only a few days and does not appear to cause any long-term health effects. The virus can cause more severe disease in humans, "West Nile encephalitis," West Nile meningitis or West Nile meningoencephalitis. Encephalitis refers to an inflammation of the brain, meningitis is an inflammation of the membrane around the brain and the spinal cord, and meningoencephalitis refers to inflammation of the brain and the membrane surrounding it.

Another recent epidemic to impact Louisiana was H1N1 (also referred to as "swine flu"). Per the CDC, H1N1 is a new influenza virus first detected in people in the United States in April 2009. It spread much like the seasonal flu spreads worldwide. In 2009, there were 1,472 confirmed cases of this virus and 20 deaths in Louisiana, although it was suspected that more than 97,000 cases of H1N1 occurred. Cases have been confirmed in the New Orleans area. The University is especially concerned with the idea that students, faculty, and staff at any location can get sick with flu, and institutions may act as a “point of spread.” Students, faculty, and staff can easily spread flu to others in their institutions as well as in the larger community. Per the CDC, the highest number of cases of 2009 H1N1 flu have been confirmed among people 5–24 years old. They are also at risk of getting seasonal influenza.

2.11.2 Area Affected

The threat from any epidemic depends in part on how the disease is spread and how easily it can be prevented and controlled. Diseases that are spread from person to person require different control measures and may be harder to manage than diseases that spread from insect to person. Another factor that will determine how vulnerable The University of New Orleans is to any given epidemic is the length and severity of the illness caused by the disease.

2.11.3 Historical Occurrences

According to the Director of the Student Health Office, there have been no known deaths related to any epidemic on any UNO campus. However, two Tulane students in separate incidents died of meningococcal septicemia (meningitis) in the year of 2001, which resulted in the majority of students receiving vaccines. Meningitis is a rare blood infection that initially begins with minor-like cold symptoms and then proceeds rapidly causing high fever, rapid heart rate, low blood pressure and death. It is spread through close contact with an infected individual, for example, drinking after another individual, sneezes, coughs, and kissing.

2.11.4 Frequency

Considering the flu pandemic following World War, and more recent incidents of the West Nile and H1N1 viruses, chances of the occurrence of an epidemic are two or three in every 100 years.

Frequency: 0.03

2.11.5 Threat to People

If an epidemic were to break out on campus, any susceptible person could be contaminated with the illness. It could easily spread to faculty, staff, and students.

2.11.6 Property Damage

No direct property damage is caused by an epidemic. However, particular buildings may have to be quarantined and disinfected, which could result in temporary or long-term closure of facilities and the potential cancellation of campus activities.

2.12 MOLD

2.12.1 Description

Molds are fungi that can form both indoors and outdoors; their growth is spurred by the presence of excess moisture, as well as the presence of standing water. Continued humid and damp conditions contribute to further growth of molds; this is likely to occur as the result of the effects of natural hazards such as tropical storms, hurricanes, and floods. However, once mold spores are formed, they have the ability to thrive in the absence of moist and humid conditions.

Indoor mold damage resulting from water damage from Hurricane Katrina

Mold in its early stages is known as mildew. Outdoors, mold tends to grow in shady or damp areas or places where leaves and other vegetation are decomposing. Indoors, mold tends to grow where humidity levels are the highest, such as basements and showers. Molds digest organic material, and they usually grow on surfaces such as wood, ceiling tiles, cardboard, wallpaper, carpets, drywall, fabric, plants, food, and insulation.

2.12.2 Area Affected

Based on the number of surfaces on which mold is able to grow (and subsequently reproduce), the threat of the mold hazard affects all buildings on each of the UNO campuses.

2.12.3 Historical Occurrences

Mold posed a huge problem to UNO's campuses following Hurricane Katrina, mostly due to stormwater intrusion. According to UNO Vice-Chancellor Joel Chatelain, "100% of the buildings on [the main] campus were damaged by molds after Hurricane Katrina" (personal interview, February 22, 2006). Campus records do not include detailed reports on instances of mold as they would report other hazard events. During both Katrina and Gustav, there was damage from mold. With every structure hit by mold during Katrina, carpets on lower floors were particularly hard hit. During Gustav, there was mold damage in the Library, Chemical Sciences Building and Recreation Center. On the East Campus, mold damage occurred in the Concessions Building.

2.12.4 Frequency

Mildew and molds continue to grow and reproduce until measures are taken to eliminate the source of the problem (typically moisture). On a university campus with maintenance staff, the sources of mold problems can be dealt with swiftly and efficiently. However, if there is no electricity and thus no ability to ventilate building, which occurred following Hurricane Katrina, molds will continue to grow and cause damage to the surfaces on which they have formed.

Frequency: 0.02.

2.12.5 Threat to People

Thousands of molds exist, and mildew and molds can grow and reproduce on a number of surfaces and in a number of environments. Under the right conditions, and when found in high concentration, all molds can be hazardous to human health. A few molds produce harmful mycotoxins that can cause serious problems. However, with the right conditions and high concentrations, all molds are capable of adversely affecting human health. People who are allergic to mold may exhibit a number of mild symptoms, including nasal stuffiness, eye irritation, wheezing, or skin irritation. More serious side effects of exposure to mold include fever and shortness of breath.

Mold in the Engineering Building at UNO in 2005

People at higher risk for adverse health effects from mold are infants, children, immune-compromised patients, pregnant women, individuals with pre-existing respiratory illnesses, and the elderly.

2.12.16 Property Damage

Seeing and smelling mold is a good indication of a mold problem. There may be hidden molds if a building smells moldy, or if you know there has been water damage. Molds may be hidden in places such as the back side of drywall, wallpaper, or paneling; the top side of ceiling panels; or the underside of carpets and pads. Other possible locations of hidden mold include areas inside walls around pipes (with leaking or condensing pipes), the surface of walls behind furniture (where condensation forms), inside ductwork, and in roof materials above ceiling tiles (due to roof leaks or insufficient insulation). Cleaning must remove – not just kill – the molds, because dead spores can still lead to health problems.

2.13 DAM FAILURE

2.13.1 Description

Generally defined, dams are artificial barriers that impound or divert water. Dams can fail for a variety of reasons to include: overtopping caused by floods, acts of sabotage, structural failure, movement/failure of supporting foundation, settlement and cracking of concrete or embankment, piping and internal erosion of soil, and inadequate maintenance (FEMA). Dam failure can of course result in flooding.

2.13.2 Area Affected

There are more than 80,000 dams across the United States with 557 located in the State of Louisiana. Per the 2010 Hazard Mitigation Plan Update for Orleans Parish, there is one dam located in Orleans Parish at the Carrollton Water Purification Plant. This dam is classified as one of 71 “significant” dams located in our State. As this dam contains just 500 acre-feet of water and is located 5.2 miles from UNO’s campus, failure would not inundate any area near campus.

2.13.3 Historical Occurrences

There have been no reports of flooding caused by dam failure in Orleans Parish.

2.13.4 Frequency

No dam provides a direct threat to the University.

Frequency: 0.00

2.13.5 Threat to People

The one dam located in Orleans Parish is rated as a significant hazard dam; a rating given to those dams where potential failure results in “no probable loss of human life” (FEMA 2004). Due to its size and location, UNO is not threatened by the potential failure of this dam.

2.13.6 Property Damage

There have been no reports of property damage as a result of dam failures in Orleans Parishes.

2.14 HAZARDOUS MATERIALS SPILLS

2.14.1 Description

A hazardous material is anything that may cause damage to persons, property, or the environment when substances are released into soil, water, or air. As many as 700,000 products pose physical or health hazards that can be defined as hazardous chemicals. Each year more than 1,000 new synthetic chemicals are introduced. Hazardous substances are categorized as toxic, corrosive, flammable, irritant, or explosive.

Technicians in HAZMAT suits recovering material from a chemical spill

2.14.2 Area Affected

The University of New Orleans could experience hazardous chemical fallout of some kind due to the presence of science labs on the main campus and the nearby CERM Building, as well as campus proximity to railroad lines, the Interstate and the Mississippi River, and the variety of chemical plants within the Greater New Orleans area.

Typical chemicals used in area plants include hydrochloric acid, ammonia, chlorine, chromium, manganese, nickel, propane, methyl isobutyl ketone, and styrene. A leak at one of these plants could cause health problems for persons on campus, property damage, and losses due to cancelled classes and research.

UNO campuses also face threats from chemicals that are transported through the metropolitan area on highways, railways, and waterways. Interstate 10, a major east-west corridor, runs through Orleans Parish and is within 3 miles or fewer of UNO. Because of its proximity to several major ports (including Jacksonville, New Orleans, Houston, Los Angeles), I-10 serves as a major transportation route for many freight trucks and is less than 5 miles from campus. Six major freight rail companies operate in the New Orleans area, including Illinois Central, CSX, Norfolk Southern, Kansas City Southern, BNSF, and Union Pacific. Many toxic chemicals are transported by rail through New Orleans routinely. While transportation incidents attract larger media attention, statistics show that almost 75 percent of all acute hazardous material events, excluding fuel spills, occur in the fixed locations where they are used or stored.

Hazardous chemical incidents in the UNO laboratories would be localized to the labs and their immediate environs, however incidents from a transportation or plant accidental release may put the entire campus at risk due to wind variations.

2.14.3 Historical Occurrences

Per the State Hazard Mitigation Plan, the State of Louisiana receives an average of 5,000 reports of accidental hazardous materials releases annually. Most accidental releases occur while chemicals are being transported along major highways.

Oil spill resulting from overturned/derailed railway car

The U.S. Department of Transportation’s Pipeline and Hazardous Material Safety Administration has a specification for what are referred to as “serious incidents." This classification entails one or more of the following conditions:(1) a fatality or major injury caused by the release of a hazardous material; (2) the evacuation of 25 or more persons as a result of release of a hazardous material or exposure to fire; (3) a release or exposure to fire which results in the closure of a major transportation artery; (4) the alteration of an aircraft flight plan or operation; (5) the release of radioactive materials from Type B packaging; the release of over 11.9 gallons or 88.2 pounds of a severe marine pollutant; or (6) the release of a bulk quantity (over 119 gallons or 882 pounds) of a hazardous material.

Since 2001, 98 hazardous materials incidents have occurred in Orleans Parish, according to the PHMSA, over the past 10 years totaling more than $55,000 in damages; one of these events resulted in a non-hospital injury.

2.14.4 Frequency

The overall probability for exposure at a UNO campus to a hazardous material is relatively low. People most likely to encounter hazardous material exposure are professors and students working in the science labs, and emergency personnel that respond to emergency calls without being forewarned that hazardous materials may be involved.

Frequency in Orleans Parish: 9.8.
Frequency near campus: 0.01

2.14.5 Threat to People

Hazardous chemicals released into the environment can penetrate water, food and human processes. It is important to recognize that exposure to chemical compounds that are categorized as hazardous have the potential to develop adverse effects when exposed to vulnerable populations and environments.

Toxic chemicals often produce injuries to communities, people, environments, and to almost any part of the body they come into contact with, typically the skin and the mucous membranes of the eyes, nose, mouth, or respiratory tract.

Corrosive substances can cause severe damage by chemical action to living tissue, other freight, or the means of transport.

Flammable substances are materials which are liable to cause fire by friction, absorption of water, spontaneous chemical changes, or retained heat from manufacturing or processing, or which can be readily ignited and burn vigorously.

Irritant means a substance that will produce local irritation or inflammation such as on skin or eyes, or that will, after inhalation, produce local irritation or inflammation of nasal or lung tissue.

An *explosive* means a solid or liquid material, or a mixture of materials, which is in itself capable by chemical reaction of producing gas at such a temperature and pressure and at such a speed as to cause damage to its surroundings.

A hazardous materials accident can occur almost anywhere on campus or the surrounding area, depending on the processes, for example: storage, shipping, development, etc., associated to the hazardous materials. In a severe event, there is potential for closure of public buildings, widespread interruption of classes and research, and economic losses while cleanup is completed.

There is a low, medium, and high range that can be associated to the severity that again is dependent on the type of chemical, the amount, location, and affected environments. Hazardous material incidents can range anywhere from small releases at a campus laboratory to rapidly expanding events that can endanger communities and environments.

People in close proximity to facilities producing, storing, or transporting hazardous substances are at higher risk. Populations further downstream and in the periphery of released substances are particularly vulnerable depending on the substance and Emergency Management's attempts to contain the hazardous material leakage.

2.14.6 Property Damage

In the worst case, there could be injuries or death to the individuals affected by a hazmat incident. Yet buildings and other facilities may also be affected. Facilities may have to evacuate depending on the quantity and type of chemical released, or campus officials might close a building or area for hours, possibly days until a substance is properly cleaned up.

Buildings and facilities located near the site of a hazardous materials spill or release are likely to be unaffected unless the substance is airborne and poses a threat to areas outside the accident site. In that case, campus and other local emergency officials would order an immediate evacuation of areas that could potentially be affected. Depending on the type of hazardous substance, it could take hours or days for campus officials to deem the area safe for return. In some cases, special equipment might be used to decontaminate people, objects or buildings affected. Workers might need medical attention. In the meantime, productivity losses are likely.

There have been no reports of damage at UNO.

2.15 NUCLEAR ACCIDENTS

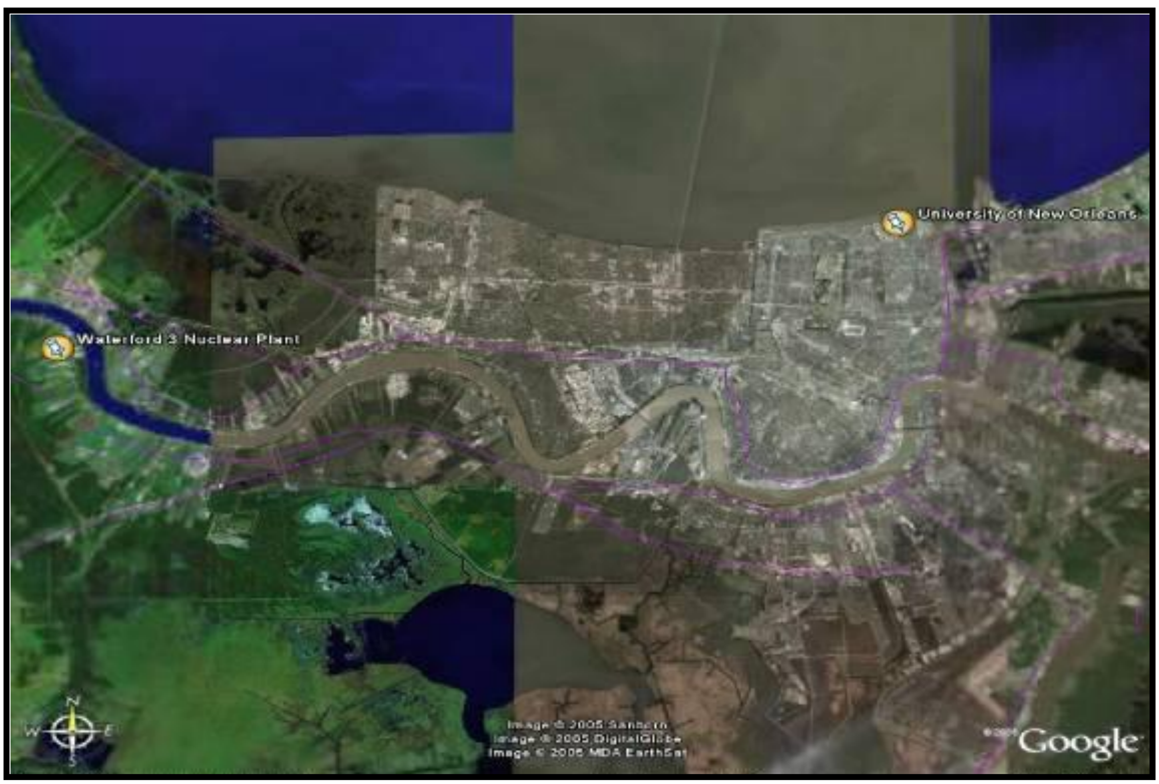
2.15.1 Description

Nuclear Accident generally refers to events involving the release of significant levels of radioactivity or exposure of workers or the general public to radiation. Nuclear accidents are classified in three categories:

1. Criticality accidents involve loss of control of nuclear assemblies or power reactors.
2. Loss-of-coolant accidents result whenever a reactor coolant system experiences a break or opening large enough so that the coolant inventory in the system cannot be maintained by the normally operating makeup system.
3. Loss-of-containment accidents involve the release of radioactivity and have involved materials such as tritium, fission products, plutonium, and natural, depleted, or enriched uranium. Points of release have been containment vessels at fixed facilities or damaged packages during transportation accidents.

2.15.2 Area Affected

The nuclear plant within Southeast Louisiana, designated Waterford Unit 3, is in St. Charles Parish, 25 miles WNW of New Orleans and 50 miles SSE of Baton Rouge. It is located on the Mississippi River near Taft, Louisiana, 13 miles from the City of Kenner.



Map showing Waterford III in relation to UNO

2.15.3 Historical Occurrences

There has only been one nuclear incident above the “Alert” classification in the United States, at the TMI nuclear facility, which is located approximately 9 miles southeast of the boundary of Cumberland County, along the Susquehanna River near Harrisburg. Pennsylvania. In March 1979, a “Site Area Emergency” classification event occurred at the TMI Unit 2 that came to be known as the most serious commercial nuclear accident in U.S. history.

The resulting contamination and state of the reactor core led to the development of a 10-year cleanup and scientific effort. Despite the severity of the damage, no injuries due to radiation exposure occurred. There were however, significant health effects reported due to the psychological stress on the individuals living in the area.

There have been no major incidents related to Waterford 3 reported to this date.

2.15.4 Frequency

Across the United States, a number of “Unusual Event” and “Alert” classification level events occur each year at the 100+ nuclear facilities that warrant notification of local emergency managers. Of these, Alert-level emergencies occur less frequently. For example, in 1997, there were 40 notifications of Unusual Events and three Alert-level emergencies nationwide.

However, per the United States Nuclear Regulatory Commission[6], statistics show that the number of significant events has dropped from an industry average of 0.9 per year in 1989 to 0.01 per year in 2006. A significant event affects the performance of a plant, increases the probability of damage to its core or causes an abnormal occurrence in plant operations.

Frequency for significant nuclear accidents is .01.

2.15.5 Threat to People

Exposure to radiation can have a dramatic and immediate effect on the human body. The gastrointestinal system is very sensitive to radiation, leading to nausea and vomiting immediately after exposure. The blood system is often the hardest hit, although antibiotics and transfusions may allow a recovery. But severe radiation damage to the

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[6] United States Nuclear Regulatory Commission, http://www.nrc.gov/.

immune system can cause overwhelming infections. And although nerves and the brain are most resistant to radiation, acute exposure usually results in damage to the central nervous system. High doses can kill outright.

The long-term effects of radiation exposure can include sterility, cancer and genetic damage that can be passed to children. There are three ways to minimize the risk of radiation exposure:

- Time: Radioactive materials decompose and lose strength over time. For some materials, the process is quick, but for others, it takes centuries.
- Distance: The further away from the source of radiation, the better.
- Shielding: In an exposed area, heavy, dense materials such as lead offer protection.

The duration of primary exposure could range in length from hours to months; however, the University of New Orleans campuses are located outside of the 10 mile Plume Exposure Pathway. Therefore the impact of a nuclear incident is determined to likely be moderate at UNO. UNO is located inside the Ingestion Exposure Pathway defined as a radius of 50 miles surrounding Waterford 3 where resources could be contaminated because of a release of radioactive materials into the atmosphere. The risk lies in possible ingestion of contaminated water or foods.

2.15.6 Property Damage

The environmental consequences from exposure to radiation levels can have serious long-term effects on buildings and property. Radiological contamination can render affected areas unusable for significant periods of time.

The main campus of the University of New Orleans is a Reception Center for Orleans Parish in the event of an emergency at Waterford 3, and participates in a drill with Waterford personnel every three years.

2.1.16 CIVIL UNREST

2.16.1 Description

Civil unrest is an individual or collective action causing serious interference with the peace, security, and/or functioning of a community (e.g., riot).

Our country’s history has many examples of civil unrest. The modern civil disturbance has become increasingly associated with sports events and issues unrelated to political positions. Civil disorders have become a part of the urban environment. “Riots” can now generally be classified as either being politically motivated or spontaneously erupting around an incident. The most important characteristic of civil disorders is an association with property damage and clashes with law enforcement and authorities. In some cases injuries and deaths occur.

In recent years, civil disorder typically begins as nonviolent gatherings. Injuries are usually restricted to police and individuals observed to be breaking the law. Crowds throwing bottles, rocks, and other projectiles are usually responsible for the majority of law enforcement injuries. Injuries to protestors, demonstrators, or law breakers are often the result of efforts to resist arrest, exposure to tear gas or mace, attempts to strike a police officer or from other civilians and law breakers.

Of particular concern on a university campus are celebrations resulting from outcomes of sporting events and annual holiday celebrations that may evolve into violence. The central characteristic of these “riots” have been related to substance abuse and consumption of alcohol. Incidents of this type are common in other parts of the world following soccer matches.

In the United States, civil disturbances have come to be anticipated following basketball championships (Chicago Bulls, 1991 and 1992; Detroit Pistons, 1990; Boston Celtics, 2008; the LA Lakers, 2001 and 2009; Michigan State University, 1999).

There has been an evolution of tactics used by demonstrators and agitators that has resulted in an increasingly complex confrontation/interface between officials and civilians. Sophisticated communications capabilities are now available for retail purchase. Radios and “police scanners” have made it possible for demonstrators to organize their efforts and counter law enforcement tactics. This was seen during the World Trade Organization (WTO) disturbances in Seattle, 1999. Members of one group intercepted police tactical communications and broadcast the information over the Internet. One group transmitted over an illegal FM station. The result has been an increase in the integration of efforts between federal agency officials from the Federal Communications Commission and the Federal Bureau of Investigation with local law enforcement.

There are several types of riots:

- Communal riot (“race riot”): people targeted because of ethnic group, language or religion
- Commodity riot: property is destroyed regardless of ownership
- Celebratory riot: violence to celebrate sports victory, defeat or other occasion
- Other types not typically found in contemporary U.S. -- soccer riots, food riots.

2.16.2 Area Affected

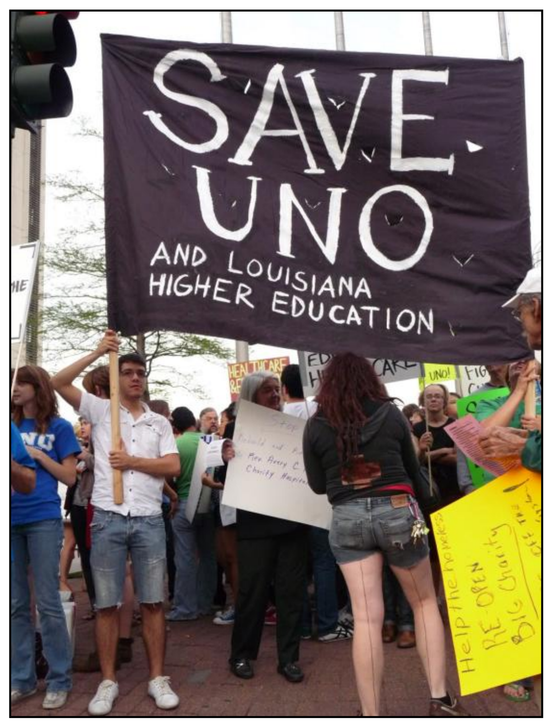
Places of public gathering are generally potential areas of greatest risk.

2.16.3 Historical Occurrences

When large groups or organizations take action all at once, the results can be disastrous and disruptive. There has been a long history of campus unrest in the U.S.:

- Students protested in favor of the U.S. Revolution
- In the late 18th Century Harvard students rioted against bad food. In the 19th Century there were riots against *in loco parentis* and other institutional policies; students protested against mandatory military training. In the 1960s-70s there was widespread protest regarding the Vietnam War and civil rights. In the 1990s-2000 riots unrelated to protest became common; these are called “celebratory riots,” “mixed issue campus disturbances,” or “convivial disorders.”

At the University of New Orleans in the wake of Hurricane Katrina, storm evacuees were evacuated from area rooftops by helicopter to open ground at UNO. Subsequently, many of these evacuees broke into a number of the campus buildings and spent several days on campus, with the bulk of them, 1,500 or more, sleeping at Kirschman Hall, the brand new multi-story College of Business building. According to University Chancellor Timothy Ryan, "Apparently there was some miscommunication, because they were left there for several days," adding there was "some substantial damage done, but reparable damage."



September 2010 Protests at UNO

More recently, on September 1, 2010, a student rally to protest state cuts to higher education funding resulted in two student arrests, one student receiving mace in the face, and an ankle injury to a police officer. However, campus law enforcement was capable of handling the protest.

2.16.4 Frequency

The potential exists on the UNO campus for civil unrest that exceeds the capabilities of the campus police to handle. However, the university campus has no history of civil instability at that level. The estimated frequency of civil unrest is once every 50 years.

Frequency: 0.02

2.16.5 Threat to People

The effects of civil unrest are typically felt by the population. The greatest risk is to human lives during times of unrest.

2.16.6 Property Damage

Looting can be commonly found in association with these types of events. During Hurricane Katrina, several University buildings, including CERM were looted and significant property was destroyed. There was no property damage during the 2010 event.

2.17 TERRORISM

2.17.1 Description

Officially, terrorism is defined in the Code of Federal Regulations as "...the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives." (28 CFR §0.85).

The Federal Bureau of Investigation (FBI) further characterizes terrorism as either domestic or international, depending on the origin, base, and objectives of the terrorist organization.

- *Domestic Terrorism:* The unlawful use or threat of force or violence by a group or individual based and operating entirely within the United States and without foreign direction.
- *International Terrorism:* The unlawful use of force or violence committed by a group or individual who has some connection to a foreign power.

However, the origin of the terrorist or person causing the hazard is far less relevant to mitigation planning than the hazard itself and its consequences. Following several serious international and domestic terrorist incidents during the 1990s and early 2000s, citizens across the United States paid increased attention to the potential for deliberate, harmful actions of individuals or groups.

Terrorism refers to the use of WMD, including, biological, chemical, nuclear, and radiological weapons; arson, incendiary, explosive, and armed attacks; industrial sabotage and intentional hazardous materials releases; and “cyber-terrorism.” Within these general categories, however, there are many variations.

Cyberterrorism: This is the deliberate destruction, disruption or distortion of digital data or information flows with widespread effect for political, religious or ideological reasons.

Worms and viruses are spread through shared documents and through the use of email. They self-replicate and send themselves to other users in found in the infected computer. Per the Cyberterrorism Defense Initiative, “computers and servers in the United States are the most aggressively targeted information systems in the world, with attacks increasing in severity, frequency, and sophistication each year.” The University has no control over these external risks, i.e., viruses from external sources and national cyberterrorism, except to restrict email and/or entrance of data into the university’s cyber system.

2.17.2 Area Affected

An important consideration in estimating the likelihood of a terrorist incident is the existence of facilities, landmarks, or other buildings of major importance. The Greater New Orleans area has many notable landmarks from a local historic perspective as well as several sites with national symbolism (i.e., the Superdome, French Quarter, etc.). It also has several sites of critical national infrastructure (e.g., Huey P. Long Bridge), and the Mississippi River is a major national trade corridor.

2.17.3 Historical Occurrences

The campuses of the University of New Orleans could become a target for terrorism. Al Qaeda has already listed America’s universities as potential targets. It is conceivable that a domestic or international terrorist attack could happen on one of UNO’s campuses.

Cyberterrorism: There has never been a cyber-terrorism incident on a UNO campus. However the accidental compromise of the campus cyber system may leave the University vulnerable to terrorist or criminal activity.

In 2007, it was discovered that the records of students and staff were unintentionally exposed on the Internet by the Louisiana Board of Regents (BOR). Names, addresses, Social Security numbers, and other personal data on some 80,000 students and employees in the state’s university system were accessible through the internet[15]. UNO is part of that system. Following this incident, the BOR enhanced its IT security to prevent similar occurrences.

UNO already uses student ID numbers that are not related to Social Security numbers. The University is made aware of threats and vulnerabilities through several FBI-sponsored programs such as U.S. CERT and INFRAGUARD.

In addition to domestic, international, and cyber terrorist attacks, there is the threat of terrorism from random individuals who wish to harm, injure, or kill other people for various reasons. There is the threat of individual attacks performed by a student, a group of students, and/or individuals on one of the university's campuses. For example, it is possible that an incident such as the shootings that occurred on the campus of Virginia Tech could occur at UNO. On April 16, 2007, a Virginia Tech student shot 21 fellow students on campus. It is the deadliest campus shooting in US history. Closer to home, a student at Louisiana Technical College in Baton Rouge, Louisiana shot two fellow students before shooting herself on February 16, 2008.

2.17.4 Frequency

The most probable type of terrorist activity that has potential relevance to a UNO campus is an intentional hazardous material release. A major rail transportation route is located near the campus, as is Interstate 10 and the Mississippi River, making intentional hazardous materials release a potential threat to the UNO community and the environment. The probability of terrorism occurring cannot be quantified with as great a level of accuracy as that of many natural hazards. For instance, these incidents generally occur at a specific location, such as a building, rather than encompassing an area such as a floodplain. While the likelihood of a terrorist attack is possible within the area, it is estimated to be less than one percent or 0.01.

The likelihood that a UNO campus building would be impacted by cyber-terrorism is very low, estimated also to be less than one percent.

Frequency: < 0.01

2.17.5 Threat to People

Acts of terrorism can range from threats to actual assassinations, kidnappings, hijackings, bomb scares, car bombs, building explosions, mailings of dangerous materials, computer-based attacks, and the use of chemical, biological, and nuclear weapons — weapons of mass destruction (WMD). People are particularly vulnerable to biological and chemical weapons.

2.17.6 Property Damage

Damage to campus locations could vary from potential destruction of buildings to disruption on events.

2.18 Risk Summary

This chapter provides information on the natural hazards in addition to the human-caused hazards that can impact the University of New Orleans' off-campus locations. In this chapter, data on the hazards are provided in terms of descriptions of the hazard, areas affected, historical occurrences, frequency of the hazard, and the threats presented to people and property by each hazard.

While it is hard to compare different phenomena, a general summary shows their relative importance to the University. This is done in Table 2.16.

Table 2.16. Hazard Risk Summary	
Hazard	**Annual Chance**
2.1 Floods	
Minor Flooding (Groundwater/Stormwater)	1.55
Major Flooding (Levee Failure/Hurricane)	0.020
2.2 Wind	
Thunderstorms	2.180
Tropical storms	0.400
Hurricanes	
Category 1	0.130
Category 2	0.050
Category 3	0.030
Category 4	0.010
Category 5	0.006
Tornadoes	0.28
2.3 Hail	0.57
2.4 Lightning	0.59
2.5 Storm Surge	0.090
2.6 Winter Storms	0.050
2.7 Subsidence	1.0
2.8 Drought	0.03
2.9 Earthquakes	0.070
2.10 Termites	1.0
2.11 Epidemics	0.030
2.12 Mold	0.020
2.13 Dam Failure	N/A
2.14 Hazardous Materials Spills	0.01
2.15 Nuclear Accidents	0.010
2.16 Civil Unrest	0.020
2.17 Terrorism	0.010

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CHAPTER 3. VULNERABILITY ASSESSMENT

Chapter 2 reviews the hazards that face The University of New Orleans. If they struck vacant land, there would not be much cause for concern, but because UNO has a student population of approximately 11,000 and is the largest public university in the city, third in the state, containing many critical facilities, the potential for damage, injury and deaths can be high.

Property damage after Katrina at UNO

Chapter 3 reviews how vulnerable UNO is to property damage, threats to public health and safety, and adverse impacts on university operations from each hazard. The potential for property damage is measured in dollars. It accounts for how much is exposed to damage and the likelihood of damage occurring.

This vulnerability assessment follows a nine step procedure. The steps consist of the following:

1. Inventory property subject to damage
2. Obtain values of damage-prone properties
3. Determine categories of property based on damage potential
4. Determine the level of damage to each category by hazard
5. Calculate the cost of damage by each hazard
6. Calculate the average annual cost of damage by each hazard
7. Determine the impact of the hazard on people
8. Determine the impact of the hazard on university operations
9. Summarize the findings to compare the relative impact of each hazard

Section 3.1 reviews steps 1 – 4, 3.2 - 3.3 observes that there are other impacts of hazards such as impact on people and on university operations and sections 3.4 – 3.20 describe the exposure for different scenarios for each hazard. Tables are then presented with the resulting summary data for each hazard, followed by a narrative discussion of the estimated loss of life, injuries, and impact on university operations from each hazard. Section 3.21 summarizes the findings.

3.1 PROPERTY DAMAGE

Steps 1-4 of the vulnerability assessment involve obtaining a property inventory and values of damage-prone properties for UNO's main and east campuses, and then categorizing the properties based on damage potential.

3.1.1 Building Inventory

A Lakefront campus building inventory was obtained from UNO's Department of Facility Services Office of Risk Management. The inventory does not include small structures, such as bus stops and picnic shelters, in addition to the structures and buildings located at the Research and Technology Park and others that are not part of the University's main campus.

The properties in the building inventory were categorized into three building types based on their exposure to damage. Buildings can be either Type A, Type B, or Type C. Type A buildings are expected to be the most resistant to structural damage and are composed of concrete and steel. The building materials for type B buildings include cinderbrick and brick structures, and properties classified as a type C building are composed of metal and wood. Type B buildings are expected to be resistant to water damage but not to shaking, and type C buildings are resistant to shaking but less resistant to high winds.

Table 3.1 on the next page displays the building inventory of UNO's Main and East campuses. The first category provides the building name and campus location followed by the second and third categories which show the building structures and classification of Type A, B, or C.

Table 3.1. Building inventory of UNO's Main and East Campuses

Building Name	Building Material	Bldg Type
Main Campus		
Administration Bldg.	Concrete and Steel Beam	A
Administration Annex	Concrete and Cinderbrick	A
Bicentennial Education Ctr.	Concrete and Cinderbrick	A
Bienville Hall	Cinderbrick and steel beam	A
Biology Bldg.	Cinderbrick and concrete	A
Computer Center	Concrete and metal beam	A
Children's Center	Brick	B
Cove	Concrete and Cinderbrick	A
Chemical Sciences Annex Bldg.	Brick	B
Engineering Auditorium	Concrete and steel structure	A
Engineering Bldg.	Steel beam and concrete	A
Engineering Walkway	Metal	C
Fine Arts Bldg.	Steel beam, concrete, metal	A
Facility Services Garage	Steel structure	A
Facility Services	Pre-fab aluminum siding, steel beam	C
Geology & Psychology Bldg.	Cinderbrick and concrete	A
Hazardous Storage	Concrete	A
Health and Physical Education Bldg.	Steel beam and Cinderbrick	A
Homer L. Hitt Alumni & Visitors Ctr.	Brick	B
Kirschman Hall	Steel beam and concrete	A
Liberal Arts Bldg.	Concrete, fire and ceramic brick	A
Lafitte Village - Apartment A	Concrete and Cinderbrick	B
Lafitte Village - Apartment B	Concrete and Cinderbrick	B
Lafitte Village - Apartment C	Cinderbrick walls	B
Lafitte Village - Apartment D	Cinderbrick walls	B
Lafitte Village - Apartment E	Cinderbrick walls	B
Lafitte Village - Laundry Building F	Cinderbrick walls	B
Earl K. Long Library	Steel, brick and veneer exterior	A
Mathematics Bldg.	Cinderbrick and steel beam	A
Milneburg Hall	Metal beam and concrete	A
Milneburg Hall Boiler Building	Concrete and Cinderbrick	A
North Central Plant Building	Cinderbrick and steel beam	A
Performing Arts Center	Concrete and Cinderbrick	A
Pontchartrain Hall North	Metal beam and Concrete	A
Pontchartrain Hall South	Metal beam and Concrete	A
Recreation & Fitness Center	Glass and steel structure	A
Science Bldg.	Concrete and brick structure	A
Oliver St. Pe Bldg. - (TRAC Bldg.)	Brick and stucco exterior w/concrete and metal	A

University Center	Steel beams, plaster walls	C
University Commons	Brick, metal deck, steel beams	B
UNO Central Utility	Concrete	A
Central Utility Emergency Generator Bldg	Cinderbrick building	B
UNO Warehouse (Building 16)	Galvanized metal siding, steel frame	C
East Campus		
Kiefer UNO Lakefront Arena	Steel beam structure, concrete support in arena	A
East Campus Tennis Clubhouse	Wood frame	C
East Central Plant	Cinderbrick, steel beam	A
Athletic Center	Metal beam	C
ADC Mech. Equipment Bldg.	Cinderbrick, metal deck	A
Athletic Facility	Brick	C
Field Service Facility	Brick and Stucco with concrete	A
Press Box & Concession Stand	Wood frame	C
Stadium Bathroom Bldg.	Brick	C
VIP/Press Box & Scoreboard	Steel beam, metal	C

3.1.2 Contents Values

Contents values were obtained from Facility Services.[7] However, these reported values did not appear to be realistic so FEMA HAZUS guidance was used to calculate more realistic contents values.

Content values as a percentage of building replacement value are: Residential, 50%, Commercial, 100%, and Education colleges/universities, 150%. The results for contents values are shown in Table 3.2. They are shown in four columns: HAZUS Occupancy Class, Structure Value, HAZUS Contents Multiplier, and HAZUS Contents Value.

[7] Values were obtained from the State of Louisiana Office of Risk Management by UNO's department of Facility Services.

Table 3.2 Contents values as reported by Facility Services and as calculated by FEMA HAZUS guidance

Building Name	HAZUS Occupancy Class	Structure Value	HAZUS Contents Multiplier	HAZUS Contents Value
Main Campus				
Administration Bldg.	Education	$2,134,595	150%	$3,201,893
Administration Annex	Education	$1,831,943	150%	$2,747,915
Bicentennial Education Ctr.	Education	$6,953,554	150%	$10,430,331
Bienville Hall	Vacant	$11,676,556	0%	$0
Biology Bldg.	Education	$4,120,492	150%	$6,180,738
Computer Center	Education	$4,463,058	150%	$6,694,587
Children's Center	Education	$1,518,480	150%	$2,277,720
Cove	Commercial	$1,156,836	100%	$1,156,836
Campus Police Building	Education	$1,442,600	150%	$2,163,900
Chemical Sciences Annex Bldg.	Education	$9,282,625	150%	$13,923,938
Engineering Auditorium	Education	$790,174	150%	$1,185,261
Engineering Bldg.	Education	$22,602,295	150%	$33,903,443
Engineering Walkway	Commercial	$230,900	100%	$0
Fine Arts Bldg.	Education	$2,431,773	150%	$3,647,660
Facility Services Garage	Commercial	$13,376	100%	$13,376
Facility Services	Commercial	$1,593,834	100%	$1,593,834
Geology & Psychology Bldg.	Education	$7,320,629	150%	$10,980,944
Hazardous Storage	Commercial	$30,130	100%	$30,130
Health and Physical Education Bldg.	Education	$4,448,786	150%	$6,673,179
Homer L. Hitt Alumni & Visitors Ctr.	Education	$1,952,660	150%	$2,928,990
Kirschman Hall	Education	$18,021,209	150%	$27,031,814
Liberal Arts Bldg.	Education	$7,827,937	150%	$11,741,906
Lafitte Village - Apartment A	Residential	$796,104	50%	$398,052
Lafitte Village - Apartment C	Residential	$844,686	50%	$422,343
Lafitte Village - Apartment D	Residential	$844,686	50%	$422,343
Lafitte Village - Apartment E	Residential	$844,686	50%	$422,343
Lafitte Village - Laundry Building F	Residential	$97,189	50%	$48,595
Earl K. Long Library	Education	$24,206,113	150%	$36,309,170
Mathematics Bldg.	Education	$6,856,463	150%	$10,284,695
Milneburg Hall	Education	$10,575,698	150%	$15,863,547
Milneburg Hall Boiler Building	Commercial	$176,300	100%	$7,874
North Central Plant Building	Commercial	$358,700	100%	$16,844
Performing Arts Center	Education	$8,264,236	150%	$12,396,354
Pontchartrain Hall North	Residential	$14,348,760	50%	$7,174,380
Pontchartrain Hall South	Residential	$14,260,630	50%	$7,130,315
Recreation & Fitness Center	Commercial	$9,763,899	100%	$9,763,899

Science Bldg.	Education	$10,406,805	150%	$15,610,208
Oliver St. Pe Bldg. - (TRAC Bldg.)	Education	$2,572,293	150%	$3,858,440
University Center	Education	$13,138,757	150%	$19,708,136
University Commons	Commercial	$1,662,831	100%	$1,662,831
UNO Central Utility	Commercial	$183,485	100%	$183,485
Central Utility Emergency Generator Bldg	Education	$15,502	150%	$23,253
UNO Warehouse (Building 16)	Education	$260,955	150%	$391,433
East Campus				
Kiefer UNO Lakefront Arena	Commercial	$68,443,390	100%	$68,443,390
East Campus Tennis Clubhouse	Commercial	$685,760	100%	$28,290
East Central Plant	Education	$1,096,570	150%	$1,644,855
Athletic Center	Education	$1,093,587	150%	$1,640,381
ADC Mech. Equipment Bldg.	Education	$14,556	150%	$21,834
Athletic Facility	Education	$345,000	150%	$517,500
Field Service Facility	Commercial	$320,819	100%	$320,819
Press Box & Concession Stand	Commercial	$73,360	100%	$73,360
Stadium Bathroom Bldg.	Commercial	$98,250	100%	$98,250
VIP/Press Box & Scoreboard	Commercial	$100,000	100%	$100,000

Sections 3.4 – 3.20 review the exposure of the properties described to each of the 17 hazards covered in Chapter 2. The levels of damage to each property are assessed along with the cost of damage and the average annual cost of damage by each hazard. The impacts on people and on university operations are observed followed by a summary of the findings to compare the relative impact of each hazard.

3.2 IMPACT ON PEOPLE

The impact of each hazard on individual people is described in terms of its impact on safety, health, and mental health. The safety of individuals is jeopardized by potential hazards, some hazards presenting a higher threat than others. Hazards also affect a person's health and well-being, not only physical health, but also mental health.

Mental health affects individuals in different ways. Not all individuals may need treatment after the occurrence of a disaster; however, some people will need treatment. Natural hazards and human-caused hazards both present threats to mental health. The terrorist attacks that occurred on September 11, 2001 had multiple effects on mental health. Some include the norm of living in fear and an increased level of caution and awareness. Americans and the increased fear among them in turn affected the economy, way of living, and well-being of communities.[8] Natural or human-caused hazards may also result in the development of Post-Traumatic Stress Disorder (PTSD) and other anxiety disorders in some individuals. Some symptoms of PTSD include increased anxiety, loss of appetite, disorientation, and difficulty in decision making. Other symptoms of trauma related stress or anxiety disorders may include migraines, difficulty sleeping, increased anger and suspicion, and / or depression. PTSD as well as other impacts on mental health as a result of disasters can affect an individuals' ability to function effectively at work or school, in relationships, or in other areas of their lives.

One cannot put dollar figures on these impacts. Therefore, four subjective measures of nil, low, moderate, and high are used in this chapter. At the end of the chapter, these subjective measures are converted to numbers to facilitate comparison between hazards.

3.3 UNIVERSITY OPERATIONS

"University operations" is a term that represents a combination of teaching, research, administration, information technology, and student services - activities that make a university a university. Loss or delay in implementation of these activities means that the university is not doing its job. Loss or delay of some operations, such as student housing or contracted research, mean loss of income to the school, too. These operations are further explained in Chapter 4 of this plan.

UNO struggled to maintain operations during Katrina. Following the two hurricanes, the City of New Orleans and the surrounding parishes were left without power for weeks. Restoration of electrical service to the campus did not occur until early October.

By this time, the extent of the damage was massive: water entered many of the campus buildings as roofs were blown off, windows were broken and window seals compromised due to high winds, rising flood waters inundated many first floor and basement levels of the facilities.

Floodwaters, high humidity, and high temperatures in September and October, combined with lack of air conditioning and humidity control, created an extensive mold growth problem in those flooded buildings and among those which lost large portions of their roofs. The mold growth required removal and discard of extensive amounts of drywall, insulation, flooring, equipment and furniture throughout the campus.

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[8] Blueprint for Responding to Mental Health Needs in Times of Crisis

The State of Louisiana Department of Health and Human Services halted the needed repairs to the buildings until a certified health inspector issued facilities a “clean bill of health”. The resulting damage to 60 campus buildings and its infrastructure necessitated the closure of the main campus until January 2006.

In addition to the damage from flooding and mold, evacuees made way to the campus after the storm forced entry into many buildings seeking protection and food resulting in serious damage to the university.

Major Flooding on UNO's campus and Leon C. Simon

The effects of the two storms on university operations were multi-fold:

- Interruption of the University’s teaching, research and public service mission;
- A negative impact on the regional economy of $600 million;
- Loss of housing for students, especially foreign students;
- Faculty and student departures;
- Decreases in research investments;
- Reduction of state and federal funding.

Because so much of the impact cannot be measured in dollars, the impact of a hazard on university operations is also described in the subjective terms of nil, low, moderate, and high.

3.4 FLOODS

There are two levels of floods used to calculate the impact of flooding: minor and major. Minor floods include the frequent, shallow flooding caused by heavy storms whereas major floods are the rarer, deeper, floods that accompany pumping failure or a levee break.

3.4.1 Minor

Minor flooding includes stormwater and groundwater flooding. As discussed in Chapter 2, stormwater flooding and groundwater flooding are both the result of an overflow of water in the drainage system or the water table.

- **Property**

Although a single storm will not flood the entire area, all properties listed in the building inventory are exposed to the hazard.

The cost of damage by a minor flood to each building was calculated by a formula that multiplies the contents values times the “percent damage” figure. Because the damage only reaches the first floor, the value of first floor damage is calculated by dividing the damage figure by the number of stories. Because the first floor has more valuable equipment on it than the higher floors, the result is multiplied by 1.25. The “percent damage” multiplier was adjusted so that the results approximate the estimated dollar damage reported for those buildings that were flooded by Hurricane Katrina. This formula to calculate minor flood damage works for most buildings.

Buildings with basements are more susceptible to this type of minor flooding. There are only two buildings with basements on the UNO campus, Sciences and Liberal Arts. These have had problems in the past during stormwater and high groundwater flooding when water enters the basements and damages the electrical service, heating and air conditioning equipment. Therefore, a higher percent damage figure is used for these structures, but in response to previous damages, the electrical infrastructure has been moved out of the basement to safer levels.

When the frequency of the hazard is included in the vulnerability analyses, the aggregate costs will accurately reflect the annual risk. The same applies to the remaining hazards in Chapter 3.

Table 3.3. Property damage from minor flooding

Building Type	Percent Damage	Damage from One Event	Average Annual $ Damage

A − Concrete	0.01%	$11,667	$18,084
B − Cinderbrick	0.01%	$1,167	$1,810
C – Frame	0.01%	$2,416	$3,746
Basements	2.50%	$7,324	$12,085
		$22,576	$35,725
Frequency	1.55		

- **People**

A minor flood usually does not kill or harm anyone. No shelters are opened as a result of minor flooding. If the need arises, anyone who is affected by minor flooding or whose homes sustain damage from minor flooding usually find friends or relatives to house them temporarily. There are no reported health problems.

Safety: low, Health: nil, Mental Health: nil

- **University Operations**

Minor flooding will not disrupt university operations. Stormwater and/or groundwater flooding may delay attendance to classes and result in early closure of the campus but will not prevent teaching, research, or administrative activities for other than a day, possibly two. The impact of minor flooding is low on university operations.

Impact: nil

3.4.2 Major Flooding (Includes Hurricane and Levee Failure)

This type of flooding involves severe damage to the city's pumping system from inundation from the river or lake or from hurricanes or levee failure. UNO is protected from the Mississippi River and Lake Pontchartrain by a levee system. Threats to campus come primarily from riverine flooding from the Mississippi that could devastate the city, or from hurricane flooding caused by the failure of either the levee to the north of UNO's main campus or other levee/floodwall combinations along the canals that drain into the lake. One such canal levee protects the western boundary of the University from flooding of the London Canal. It was this levee that failed during Hurricaen Katrina.

As a result of multiple breaches in the levee system during Hurricane Katrina, the influx of water from Lake Pontchartrain overwhelmed Orleans Parish pumping stations in effect causing them to fail when these pumping stations would usually keep surrounding neighborhoods dry. Failures in the levee system resulted in flooding approximately 80 percent of the city with waters as much as 20 feet high.

- **Property**

A levee failure during a hurricane is a rare occurrence with the frequency of 0.02 or odds of once in 50 years. Levee failures cause deep flooding which causes major damage to property. The entire UNO campus is vulnerable to property damage from major or hurricane flooding.

Unlike the minor flooding calculations, structural value is included in the formula along with contents value. Even though major flooding is deep, it is not expected to go higher than the first floor, so the total building value is divided by the number of stories and multiplied times 1.25. Table 3.4 shows the percent damage and the annual and average costs for property damage from major flooding.

Table 3.4 Property damage from levee failure

Building Type	Percent Damage	Dollar Damage	Average Annual $ Damage
A − Concrete	25.00%	$53,636,255	$1,072,725
B − Cinderbrick	25.00%	$5,343,767	$106,875
C − Frame	25.00%	$10,385,862	$207,717
Basements	30.00%	$1,831,105	$43,947
		$71,196,990	$1,431,264
Frequency	0.02		

Table 3.5 Property damage from hurricane flooding

Building Type	Percent Damage	Dollar Damage	Average Annual $ Damage
A − Concrete	25.00%	$53,636,255	$1,072,725
B − Cinderbrick	25.00%	$5,343,767	$106,875
C − Frame	25.00%	$10,385,862	$207,717
Basements	30.00%	$1,831,105	$43,947
		$71,196,990	$1,431,264
Frequency	0.02		

- **People**

When a levee fails, it can be sudden. Because people were killed by the flooding after Hurricane Katrina, it is expected that the Orleans Levee District Police and the Campus Police will be even more diligent when flood levels reach a height where there is a potential for failure, to ensure that the area is evacuated and that patrols will monitor and respond to any threat, thus minimizing the life safety threat.

Safety: moderate, Health: moderate, Mental Health: high

- **University Operations**

Major flooding, such as that from a levee failure, has a high impact on university operations.

This was exemplified following Hurricane Katrina. Classes on campus came to a halt and teaching was suspended until the university was able to get more distance learning available for students.

All other university operations such as research, administration, housing, and information technology were severely disrupted.

However, not all of the disruptions were directly from the major flooding; some could be attributed to other hazards that the storm brought with it, particularly mold and civil unrest. Structures were damaged as a result of mold and civil unrest from looters during the storm which delayed or prevented classes and activities. After approximately four months, classes and other university operations were able to resume on campus.

Impact: high

3.5 WIND

There are four levels of wind that are used to determine the impact of damage by wind on each property and the average costs of damage. These levels include thunderstorms, tropical storms, hurricanes of categories 2-5, and tornadoes. The Saffir-Simpson Scale is used as a reference for the levels of wind.

Kiefer Lakefront Arena on UNO's East Campus * Note wind damage from Hurricane Katrina

Some structures on campus may be more susceptible to damage than the other structures on campus. This holds true for "arenas" or other buildings with wide spans and large open areas. Three buildings on campus were categorized as "arenas" and given a higher damage potential from high winds:

- Health and Physical Education
- Recreation & Fitness Center
- Kiefer Lakefront Arena

3.5.1 Thunderstorms

Thunderstorms include winds that are less than 39 mph. They occur frequently but cause little or no damage and are a minimal threat to people.

- **Property**

Most recently constructed buildings are built to withstand winds up to 120 mph. There is no property damage from the first level of wind or thunderstorms.

- **People**

Thunderstorms do not present much danger to people. The threat to life varies by the cause of death. Thunderstorms can bring flash floods, wind, and lightning. The safety impact of these hazards is picked up in their sections. No special health problems are attributable to thunderstorms.

Safety: nil, Health: nil, Mental Health: nil

- **University Operations**

Winds from thunderstorms have practically no impact on university operations. Occasionally, higher winds may knock out power lines which cause some disruptions to classes and information technology. Downed servers may prevent students from gaining access to email and Blackboard.

Impact: nil

3.5.2 Tropical Storms

Tropical storms have winds ranging from 39 mph to 73 mph. However, because the university is on the lake, storm-related winds are more severe because the buildings do not have structural or natural buffers.

- **Property**

Damage from wind affects properties throughout the campus. Recall that the percent damage figure is the expected percent of damage that would be done to each building type.

The following columns in Table 3.5 include the expected costs in dollar damage for one event or one occurrence of the specified hazard and the expected average costs spent annually on the amount of damage for the specified hazard, in the case below, tropical storms.

The “percent damage” multiplier was adjusted so that the results approximate the estimated dollar damage reported for those buildings that suffered wind damage from recent storms, such as Tropical Storm Cindy.

The “dollar damage” figures are the contents and structure values (from Table 3.2) multiplied times the “percent damage” figures. This provides the total estimated dollar damage to each building type and for the whole campus. The “average annual dollar damage” accounts for how often the hazard is expected to strike. It is the dollar damage figure multiplied times the frequency. While a single occurrence of a hazard incident may cause a lot of dollar damage, the campus’ vulnerability must reflect the likelihood of occurrence and the exposure of the buildings to damage over the years.

Table 3.6 Property damage from tropical storms

Building Type	Percent Damage	Dollar Damage	Average Annual $ Damage
A − Concrete	1.00%	$31,652,422	$12,660,969
B − Cinderbrick	1.00%	$366,874	$146,749
C − Frame	1.00%	$725,173	$290,069
Arenas	1.00%	$1,675,365	$670,146
		$34,419,834	$13,767933
Frequency	0.400		

- **People**

Under the tropical storm scenario, there are no deaths and only a few minor injuries from falling limbs or flying debris. Many individuals evacuate the area, and most of them find friends or relatives to house them if they feel the need to leave the area. As for students at the university regarding tropical storms, evacuations are their responsibility. There have been no evacuations of students for tropical storms.

Safety: moderate, Health: moderate, Mental Health: low

- **University Operations**

The impact of wind from tropical storms for university operations is a little greater than it is for thunderstorms.

Wind may disrupt some teaching and perhaps information technology, but other operations such as research, student services, and administration are likely to continue unless the storm was predicted to be of a higher category and campus closure was undertaken to insure safety.

Impact: low

3.5.3 Hurricanes (Categories 1-5)

Hurricanes bring winds up to 155 mph. A category 5 hurricane, the "worst case" hurricane scenario, would bring winds exceeding 150 miles per hour and a storm surge up to 18 feet along the Lake Pontchartrain shore.

Property

Wind damage can be spread evenly throughout the campus; however in instances, depending on the locations, some buildings may serve to buffer other structures preventing or lessening damage to them. There will be significant wind damage to roofs, street lights, transformers, and buildings. The "percent damage" multiplier was adjusted so that the results approximate the estimated dollar damage reported for those buildings that suffered wind damage from Hurricane Katrina. Given the preoccupation of hurricanes and the extent of the threat to property from hurricanes, the property damage from hurricanes has been calculated separately for each category hurricane, 1-5.

Table 3.7 Property damage from Category 1 hurricanes

Building Type	Percent Damage	Dollar Damage	Average Annual $ Damage
A − Concrete	2.00%	$8,853,788	$1,150,992
B − Cinderbrick	2.00%	$733,747	$95,387
C − Frame	4.00%	$1,994,258	$259,254
Arenas	4.00%	$6,701,462	$871,190
		$18,283,355	$2,376,823
Frequency	0.13		

Table 3.8 Property damage from Category 2 hurricanes

Building Type	Percent Damage	Dollar Damage	Average Annual $ Damage
A − Concrete	3.00%	$13,280,682	$664,034
B − Cinderbrick	3.00%	$1,100,621	$55,031
C − Frame	6.00%	$1,984,460	$149,223
Arenas	6.00%	$10,052,193	$502,610
		$27,417,956	$1,370,898
Frequency	0.05		

Table 3.9 Property damage from Category 3 hurricanes

Building Type	Percent Damage	Dollar Damage	Average Annual $ Damage
A − Concrete	5.00%	$22,134,470	$664,034
B − Cinderbrick	5.00%	$3,584,695	$107,541
C − Frame	10.00%	$23,565,542	$706,966
Arenas	10.00%	$16,753,654	$502,610
		$66,038,362	$1,981,151
Frequency	0.030		

Table 3.10 Property damage from Category 4 hurricanes

Building Type	Percent Damage	Dollar Damage	Average Annual $ Damage
A – Concrete	7.00%	$30,988,258	$309,883
B – Cinderbrick	7.00%	$12,568,115	$25,681
C – Frame	15.00%	$7,458,014	$74,580
Arenas	15.00%	$25,130,481	$251,305
		$66,144,869	$661,449
Frequency	0.010		

Table 3.11 Property damage from Category 5 hurricanes

Building Type	Percent Damage	Dollar Damage	Average Annual $ Damage
A – Concrete	9.00%	$411,318,425	$2,467,911
B − Cinderbrick	9.00%	$36,687,362	$220,124
C − Frame	20.00%	$50,054,706	$300,328
Arenas	20.00%	$167,536,543	$1,005,219
		$665,597,035	$3,993,582
Frequency	0.006		

- **People**

The safety hazard is considered high because not everyone evacuates, in part because they expect the roads to be too crowded, they want to stay with their pets, protect their property, or they just do not have the transportation. Some people will likely be killed and severely injured from the wind if their homes are destroyed by the tornadoes embedded within the hurricanes or if tree limbs fall on them.

Delays in obtaining help to repair and rebuild keep thousands of families and students in temporary housing away from the area and for those nearby, adding greatly to commuting and travel times. Those waiting for a decision on whether they will be allowed to rebuild are particularly hard hit. The destruction, the costs, the delays, and the uncertainty take their toll and there is an increase in family interpersonal crises and reported mental health problems.

Safety: high, Health: moderate, Mental Health: high

- **University Operations**

Winds from hurricanes are much stronger than winds from a thunderstorm or a tropical storm and have a moderate impact on university operations. Electrical wire and posts may go down causing the systems to go down. Classes on campus are usually cancelled, hence teaching is suspended. The University will be closed, thus administration and student services are affected.

Impact: high

3.5.4 Tornadoes

Tornadoes have winds greater than 155 mph, up to 300 mph. While 17 tornadoes have struck somewhere in Orleans Parish since 1950, the odds of a tornado striking a particular property are very low.

- **Property**

Damage to property by wind from tornadoes will not affect every building on campus as it will from a hurricane. Unlike the path of a hurricane, the path of a tornado is much narrower. The path can be as narrow as 100 feet. The average tornado in Orleans Parish affected 43 acres.

Table 3.12 Property damage from tornadoes

Building Type	Percent Damage	Dollar Damage	Average Annual $ Damage
A − Concrete	12.50%	$55,336,175	$15,494,129
B − Cinderbrick	12.50%	$4,585,920	$1,284,058
C − Frame	25.00%	$12,464,114	$3,489,952
Arenas	25.00%	$41,884,136	$11,727,558
		$114,270,345	$31,995,697
Frequency	0.28		

- **People**

Tornadoes strike with only a few minutes' warning. In an average year, 800 tornadoes are reported across the United States, resulting in 80 deaths and over 1,500 injuries[9]. Alternate locations for classes, research activities, etc., may need to be relocated in the event a tornado strikes and destroys a University building.

Safety: high, Health: moderate, Mental Health: high

- **University Operations**

Tornadoes have a moderate impact on university operations. Winds from a tornado are greater than thunderstorms, tropical storms, and hurricanes, yet these winds have a narrow path and will likely not affect every area on campus. However, those areas affected by the winds will have severe structural damage, affecting operations such as on-site teaching, research, and any other operations occurring in those buildings. Those disrupted operations in most cases will be resumed on other properties located on the campus although research facilities are so specific to that activity that research operations may not be relocated.

Impact: high

[9] http://www.nssl.noaa.gov/edu/safety/tornadoguide.html

3.6 HAIL

- **Property**

Hail damage is limited to roofs, windows, and vehicles. However, a hail storm can affect a large area and many structures. There is no differentiation by structure type. In the table below, the figures only represent damage to structures, not to contents.

Table 3.13 Property damage from hail

Building Type	Percent Damage	Dollar Damage	Average Annual $ Damage
A – Concrete	0.05%	$139,013	$79,236
B – Cinderbrick	0.05%	$8,346	$4,757
C – Frame	0.05%	$10,236	$5,835
		$157,596	$89,830
Frequency	0.57		

- **People**

Hail is not considered a threat to life and limb. Once a storm begins, people can quickly seek shelter.

Safety: nil, Health: nil, Mental health: nil

- **University Operations**

Hail has a low impact on university operations. It will not disrupt the majority of operations on campus.

Impact: nil

3.7 LIGHTNING

- **Property**

There is no differentiation by structure type. Lightning damage figures assume that all types of structures would be affected similarly. Experience has shown that the damage from a strike equals about 10% of the building's value. The table below factors in the fact that only one out of 100 buildings will be struck by lightning during an occurrence, so the percent damage figure is one-tenth of one percent of the value of all buildings on campus.

Table 3.14 Property damage from lightning

Building Type	Percent Damage	Dollar Damage	Average Annual $ Damage
A − Concrete	0.05%	$139,013	$79,236
B − Cinderbrick	0.05%	$8,346	$4,757
C − Frame	0.05%	$10,236	$5,835
		$157,596	$89,830
Frequency	0.59		

- **People**

Lighting kills more people than tornadoes. A student was killed by lightning while on the University's main campus in 1990 and three other students were knocked to the ground by the lightning strike. These students were treated at the University's student health service and did not sustain major injuries. Most lightning fatalities and injuries occur outdoors at recreation events and under or near trees.

Nationwide it is estimated that 25 million cloud-to-ground lightning flashes occur each year, 1,000 people are injured, 52 are killed.

Safety: high, Health: nil, Mental Health: nil

- **University Operations**

Lightning does not have a major effect on the majority of operations on campus, although electrical supplies may be interrupted. However, lightning may strike a building or transformer causing a fire or electrical outage, resulting in cancelled classes or student activities.

Impact: low

3.8 STORM SURGE

As discussed in Chapter 2, Orleans Parish is vulnerable to storm surge. The level of vulnerability or risk is very similar to flooding as storm surge often leads to flooding or levee failure (that may lead to flooding); flooding that significantly affects people, structures, and operations. Of course, storm surge is also related to coastal erosion and increased risk to damage from tropical storms and hurricanes.

Orleans Parish is most at risk from storm surge in the southeast area of the city where the expanded Mississippi River Gulf Outlet (MRGO) shipping channel leads directly into the Inner Harbor Navigation Canal (IHNC) from the open sea of Lake Borgne. Orleans Parish city is also vulnerable to surges from Lake Pontchartrain to the north.

The impact (level of flooding) from storm surge to the UNO campus is dependent on the level of the storm surge event. For instance, storm surge led to the overtopping of levees as well as the multiple breaches in the levee system during Hurricane Katrina. Failures in the levee system resulted in flooding approximately 80% of New Orleans with waters as much as 20 feet high.

UNO's main campus is protected from Lake Pontchartrain by a levee system that has two main parts: the levee to the north of UNO's main campus and other levee/floodwall combinations along the canals that drain into the lake. One of these protects the western boundary of the University from flooding of the London Canal.

- **Property**

Although protected by the levees, flooding caused by storm surge can lead to major damage to property. All UNO campuses are vulnerable to property damage from storm surge.

Similar to levee failures, structural value is included in the formula along with contents value. Even though major flooding is deep, it is not expected to go higher than the first floor, so the total building value is divided by the number of stories and multiplied times 1.25. Table 3.14 shows the percent damage and the annual and average costs for property damage from storm surge.

Table 3.15 Property damage from storm surge

Building Type	Percent Damage	Dollar Damage	Average Annual $ Damage
A − Concrete	0.10%	$238,842	$214,476
B − Cinderbrick	0.10%	$16,693	$15,024
C − Frame	0.10%	$20,270	$17,600
		$275,805	$247,100
Frequency	0.90		

- **People**

Storm surge may have a moderate impact on people's safety and health. The impact from a storm surge on people's mental health is high. People who experience the impacts of storm surge may feel a tremendous amount of stress and trauma. This was exemplified by Hurricane Katrina.

Safety: moderate, Health: moderate, Mental Health: high

- **University operations**

Major flooding resulting from storm surge has a high impact on University operations as was exemplified following Hurricane Katrina. Classes on the main campus came to a halt, and teaching and other services were suspended until the university was able to increase the opportunity for distance learning available for students. However, some classes did resume at UNO's Jefferson Center during the Fall of 2005 following needed repairs.

All other University operations such as research, administration, housing, and information technology were severely disrupted until the main campus opened in Spring 2006.

However, not all of the disruptions were directly from the major flooding; some could be attributed to other hazards that the storm brought with it, particularly mold and civil unrest. Structures were damaged as a result of mold and civil unrest from looters during the storm which delayed or prevented classes and activities. After approximately four months, classes and other University operations were able to resume on campus.

Impact: high

3.9 Winter Storms

- **Property**

Winter storms bring cold temperatures, snow and ice. Of these, ice causes the most problems for property. Freezing rain that accumulates on tree branches and utility lines can create a very heavy weight. When the overloaded tree branches come down, they damage roofs and vehicles. When utility lines are lost, so is the utility service.

Table 3.16 Property damage from winter storms

Building Type	Percent Damage	Dollar Damage	Average Annual $ Damage
A – Concrete	0.10%	$608,922	$26,925
B – Cinderbrick	0.10%	$36,687	$1,834
C – Frame	0.10%	$49,658	$2,403
		$695,257	$31,162
Frequency	0.05		

- **People**

Winter storms can cause injury or death to people. Extreme cold can result in people and animals suffering from frostbite and hypothermia.

Safety: moderate, Health: low, Mental Health: nil

- **University Operations**

At the most, a winter storm may freeze water pipes or disrupt utility services due to ice and fallen tree limbs. In these cases, some operations may be disrupted.

Impact: low

3.10 SUBSIDENCE

- **Property**

There is no single occurrence of subsidence, it is an ongoing activity. The damage incurred by subsidence in any one year is relatively low. Damage over time is greatest to cinderbrick buildings that can crack when there is even a minor settling of the ground.

Table 3.17 Property damage from subsidence

Building Type	Percent Damage	Dollar Damage	Average Annual $ Damage
A − Concrete	0.01%	$61,090	$61,090
B − Cinderbrick	0.02%	$7,337	$7,337
C − Frame	0.01%	$4,966	$4,966
		$73,393	$73,393
Frequency	1.00		

- **People**

There is relatively no impact on people from subsidence on campus.

Safety: nil, Health: nil, Mental Health: nil

- **University Operations**

There is relatively no impact on university operations from subsidence.

Impact: nil

3.11 DROUGHT

- **Property**

There is no property damage caused by drought. There may be some cracking of foundations or settling of roads during an extended dry period, but repairing such damage is considered a normal maintenance expense.

- **People**

The effects of drought are not likely to be threatening to human health or safety. However, because New Orleans takes its water supply from the Mississippi River, a drought which reduces the river's level may cause the salt water wedge to move up the river from the Gulf of Mexico and threaten the City's, and thus the university's water supply. This occurred during the drought of 1987-1989.

Safety: nil, Health: nil, Mental Health: nil

- **University Operations**

There is a relatively no impact on university operations from drought. While there may be restrictions on watering lawns, the result would not affect the University's ability to do its job.

Impact: nil

This hazard has a very low probability of significant impacts on the University, and therefore the mitigation strategy refers only to landscaping practices in relation to drought.

3.12 EARTHQUAKES

- **Property**

The level of damage expected from an earthquake in southern Louisiana is quite low. It would be no worse than a Modified Mercali Intensity level of V, where some dishes and windows are broken. Cinderbrick buildings are rated as more subject to damage because they are less resistant to ground shaking.

Table 3.18 Property damage from earthquakes

Building Type	Percent Damage	Dollar Damage	Average Annual $ Damage
A – Concrete	1.00%	$6,108,972	$427,628
B – Cinderbrick	2.00%	$733,747	$51,362
C – Frame	1.00%	$496,582	$34,761
		$7,339,302	$513,751
Frequency	0.07		

- **People**

The level of an expected earthquake in southeast Louisiana is not considered life threatening. Some minor injuries may result from falling objects. Because the likelihood of an earthquake occurring is low, no long-term mental health effects are expected.

Safety: moderate, Health: low, Mental Health: low

- **University Operations**

There is a relatively low impact on university operations from the type of earthquakes expected in the area. Shaking of buildings and loss of some loose contents may disrupt teaching, research and other activities on campus on a very small scale.

Impact: low

3.13 TERMITES

- **Property**

Any structure can have a termite problem, even brick structures on slab foundations. If there is wood in the building, termites can find it. Therefore, every building on campus is subject to damage. Of course, properties with wooden structures are more susceptible to damage than other structures.

Property damage from termite activity is on-going. However, termites are one of the few natural hazards that can be controlled. This can be done by implementing effective preventive measures and extermination work.

Therefore, the cost of termite damage is equated with the cost of preventing it plus the average annual cost of recent damage. The University invests in pest control approximately $67,000 each year for termites. Between 2003-2008, the University has spent $785,900 in either replacing items damaged by termites or in repairing building damage. This equates to $157,000 per year. Added to the cost of the pest control contract produces an average annual damage figure of $ 224,000.

- **People**

There is practically no life safety or mental health threat from termites.

Safety: nil, Health: low, Mental health: nil

- **University Operations**

There is no major impact on university operations caused by termites, just the additional costs of repairs to, and protection of, properties on the campuses and lack of use of the part of the building under repair.

Impact: nil

3.14 EPIDEMIC

- **Property**

Epidemics are not considered to cause property damage.

- **People**

Epidemics have a low impact on the safety of individuals, but a high impact on health and mental health of individuals. By definition, an epidemic is a high health hazard.

Safety: low, Health: high, Mental Health: high

- **University Operations**

Epidemics present a moderate impact on university operations. Unhealthy individuals do not attend classes to teach or to learn, and they do not go to work. In addition, university faculty, staff and students may remain home to avoid contamination. Therefore, some teaching, research, administration, and student services would be affected. Some buildings may have to be quarantined and disinfected, which could result in temporary or long-term closure of a few facilities.

Impact: moderate

3.15 MOLD

- **Property**

Damage by mold is not so much related to the value of the building because almost all of the buildings have similar sheetrock and insulation construction. The preliminary estimated costs to remediate the mold that followed Hurricane Katrina varied greatly from building to building.

A figure of $1.25 per square foot of floor space resulted in a total cost that approximates the total estimated cost of the post-Katrina mold, but does not produce an accurate representation of the cost for each building. However, this approach is used to provide an aggregate figure for this plan.

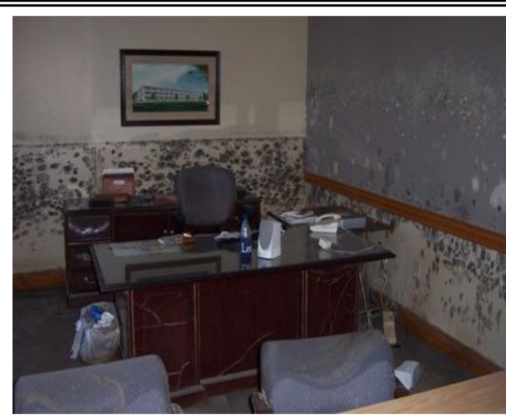
Table 3.19 Property damage from mold

Building Type	Damage/sq. ft.	Dollar Damage	Average Annual $ Damage
A – Concrete	$1.25	$22,847,505	$442,957
B – Cinderbrick	$1.25	$228,736	$4,575
C – Frame	$1.25	$1,084,498	$21,690
		$22,160,739	$469,222
Frequency	0.02		

- **People**

Mold has a low impact on the safety of individuals and a moderate impact on health and mental health of individuals. For some people, even a relatively small number of mold spores can cause health problems. Those at higher risks for adverse health effects from molds include infants, children, immune-compromised patients, pregnant women, individuals with existing respiratory conditions and the elderly.

Safety; low, Health: high, Mental Health: moderate



Property damage to an office on campus from mold

- **University Operations**

Damage from mold has a moderate impact on university operations. Mold will disrupt all university operations except for information technology, but disrupted operations may resume in other buildings on campus that do not contain mold.

Impact: moderate

3.16 DAM FAILURE

Dam failure is not addressed in this chapter as it has been determined that this hazard poses no real risk to the University.

3.17 HAZARDOUS MATERIALS SPILLS

- **Property**

It is unlikely that a hazardous materials spill would affect all buildings. Although the fumes from a spill might affect a large area and a liquid would follow the drainage ways, a spill would be concentrated in one area and only a few buildings would be subjected to property damage.

Table 3.20 Property damage from hazardous materials spills

Building Type	Percent Damage	Dollar Damage	Average Annual $ Damage
A − Concrete	0.25%	$5,282,825	$52,828
B − Cinderbrick	0.25%	$366,874	$3,669
C − Frame	0.25%	$487,698	$4,877
		$6,137,397	$61,374
Frequency	0.01		

- **People**

As with epidemics, by definition a “hazardous” material spill is hazardous to people’s safety and health.

Safety: high, Health: moderate, Mental Health: moderate

- **University Operations**

There is a low impact on university operations since hazardous material spills usually do not affect all areas of the campus, and they can be cleaned up relatively quickly. University operations can be continued with minimal disruption.

Impact: low

3.18 NUCLEAR ACCIDENTS

- **Property**

As with hazardous materials spills, the impact on buildings from nuclear accidents is low. While radiological contamination can render affected buildings unusable for significant periods of time, the UNO campus is located at a sufficient distance from Waterford 3 to make long-term contamination unlikely.

Table 3.21 Property damage from nuclear accidents

Building Type	Percent Damage	Dollar Damage	Average Annual $ Damage
A − Concrete	1.00%	$5,382,985	$53,830
B − Cinderbrick	1.00%	$366,874	$3,669
C – Frame	1.00%	$480,558	$4,806
		$6,230,416	$62,304
Frequency	0.01		

- **People**

The impact on people's safety, health, and mental health from nuclear accidents are high. Exposure to radiation can affect the gastrointestinal, blood, immune and nervous system. High doses can kill outright. The long-term effects of radiation exposure can include sterility, cancer and genetic damage that can be passed to children.

Safety: high, Health: high, Mental Health: high

- **University Operations**

If an accident and its resulting radiation affected a significant number of people and/or closed buildings because of contamination, the University's operations would be affected.

Impact: moderate

3.19 CIVIL UNREST

- **Property**

Looting, vandalism, and other destruction to property occur in times of civil unrest. This was demonstrated during Hurricane Katrina, when the damage to the campus by stranded flood victims included broken windows, stolen property, and vandalism.

Table 3.22 Property damage from civil unrest

Building Type	Percent Damage	Dollar Damage	Average Annual $ Damage
A − Concrete	2.00%	$12,174,436	$243,489
B − Cinderbrick	2.00%	$733,747	$14,675
C − Frame	2.00%	$993,164	$19,863
		$13,901,348	$278,027
Frequency	0.02		

- **People**

People may or may not be injured in incidents of civil unrest, and there is a low impact on health. However, civil unrest has a moderate impact on mental health. It can cause frustration, stress, and aggravation to those who experienced the hazard and those worried about it happening again.

Safety: moderate, Health: low, Mental Health: moderate

- **University Operations**

Civil unrest on the campus has a moderate impact on university operations. Depending on the circumstances, teaching, student services, and other operations can be disrupted due to property damage or offices closed due to strikes or sit-ins.

Impact: moderate

3.20 TERRORISM

- **Property**

As with hail and lightning, not every building will be hit. Only major buildings will be a target for terrorism. A preliminary list of “target buildings” is identified, and they are the only ones with damage figures.

The likely “target” buildings include the Central Utilities Plant, the Earl K. Long Library, University Center, Kiefer UNO Lakefront Arena, Administration building, Computing Center, Pontchartrain Halls, and the Engineering building.

There are eight target buildings, but they would not be hit at the same time. It is assumed that during a single occurrence of a terrorist attack, one building would be 50% damaged. The table below uses a factor of 50%/8 or 6.25% of all eight target buildings for the percent damaged multiplier.

Table 3.23 Property damage from terrorism

Building Type	Percent Damage	Dollar Damage	Average Annual $ Damage
A – Concrete	0.00%	$0	$0
B – Cinderbrick	0.00%	$0	$0
C – Frame	0.00%	$0	$0
Target	6.25%	$91,993,308	$919,933
		$91,993,308	$919,933
Frequency	0.01		

- **People**

People may be harmed or even killed in incidents of terrorism. Terrorist attacks make individuals vulnerable, they cause stress, frustration, worry, and bodily harm. Whether it is a cyber attack or a physical attack, the impact on safety, health, and mental health are high.

Safety: high, Health: high, Mental Health: high

- **University Operations**

A terrorist attack is likely intended to have a high impact on university operations. Whether it is a cyber attack or a terrorist attack targeted to important structures, the impact will be high. Teaching, research, administration, information technology, and student services will be disrupted.

Impact: high

3.21 SUMMARY OF VULNERABILITY ASSESSMENT

This chapter provides information on how natural and human-caused hazards affect the University of New Orleans in terms of property damage, the threat to people, and the impact on university operations.

Property damage is measured in dollars while the impacts on people and university operations are summarized in subjective terms of “nil”, “low”, “moderate”, and “high”.

These impacts vary from nil to destruction and death from a category 5 hurricane, nuclear accident, or terrorist incident. However, the severity of these impacts needs to be tempered with their likelihood of occurrence. The odds of an occurrence in any given year or the annual chance of the hazard occurring is listed as the frequency in Chapter 2.

3.21.1 Property Damage

Table 3.22 on the following page displays the impacts of hazards on property. The property damage figures are multiplied times the annual chance of occurrence to produce a dollar figure that represents average annual damage from that hazard.

The hazard causing the greatest amount of destruction in a single event is a tornado followed by levee break flooding, terrorism, hurricanes, and civil unrest.

When the dollar damage from a single event is multiplied by the frequency of occurrence, the hazards that are likely to cause the most property damage over the long run are tropical storms and levee break flooding.

Table 3.24 Property damage summary and frequencies

Hazard	Frequency	Dollar Damage	Average Annual $ Damage
–Minor Flooding	1.55	$22,576	$34,993
Major or Hurricane Flooding	0.020	$71,196,990	$1,431,264
Wind - Thunderstorms	2.180	$0	$0
Wind - Tropical Storm	0.400	$34,419,834	$13,767,933
Wind - Cat I Hurricane	0.130	$34,419,834	$4,474,578
Wind - Cat 2 Hurricane	0.050	$34,419,834	$1,720,991
Wind - Cat 3 Hurricane	0.030	$118,305,927	$3,549,178
Wind - Cat 4 Hurricane	0.010	$66,144,869	$661,449
Wind - Cat 5 Hurricane	0.006	$665,536,543	$3,993,582
Wind - Tornado	0.28	$114,270,345	$31,995,697
Hail	0.57	$157,596	$89,830
Lightning	0.59	$157,596	$92,982
Storm Surge	0.90	$157,596	$141,836
Winter Storms	0.050	$695,267	$34,763
Subsidence	1.000	$73,393	$73,393
Drought	0.03	$0	$0
Earthquakes	0.070	$73,393	$5,138
Termites	1.000	N/A	$224,000
Epidemic	0.030	$0	$0
Mold	0.020	$22,160,739	$443,215
Dam Failure	0.00	$0	$0
Haz Mat Spills	0.010	$6,137,397	$61,374
Nuclear Accidents	0.010	$22,160,739	$221,607
Civil Unrest	0.020	$13,901,348	$278,027
Terrorism	0.010	$91,993,308	$919,933

3.21.2 Impact on People

Table 3.23 is a summary of the impact on people by each hazard. The impact on people is summarized with subjective statements, nil, low, moderate, high. Each subjective term is assigned a number score. High is 100, moderate is 40, low is 10, and nil is 1. The number score of each subjective term is calculated for each hazard. The number scores for safety, mental health, and health are added and displayed in the "single event" column. The "single event" figures are multiplied times the frequency to facilitate comparison of the "average annual" threat or "people score" for each hazard.

The resulting "people score" is a numerical representation of the relative impact each hazard has on safety, health, and mental health. Unlike the dollars used for property damage, these numbers have no discrete meaning. They are used to compare the listed subjective values between hazards.

Table 3.25 Summary of the impact on people

Hazard	Safety	Health	Mental Health	Single Event	Frequency	People Score
–Minor Flooding	Low	Nil	Nil	12	1.55	18.60
Major or Hurricane Flooding	Mod.	Mod.	High	180	0.02	3.60
Wind - Thunderstorms	Nil	Nil	Nil	3	2.18	6.54
Wind - Tropical Storm	Mod.	Mod.	Low	90	0.40	36.00
Wind – Cat 1 Hurricane	Mod.	Mod.	Low	90	0.13	11.70
Wind – Cat 2 Hurricane	High	Mod.	High	240	0.05	12.00
Wind – Cat 3 Hurricane	High	Mod.	High	240	0.03	7.20
Wind – Cat 4 Hurricane	High	Mod.	High	240	0.01	2.40
Wind – Cat 5 Hurricane	High	Mod.	High	240	0.006	1.44
Wind - Tornado	High	Mod.	High	240	0.28	67.2
Hail	Nil	Nil	Nil	3	0.57	1.71
Lightning	High	Nil	Nil	102	0.59	60.18
Storm Surge	Mod.	Mod.	High	180	0.9	162.0
Winter Storms	Mod.	Low	Nil	51	0.05	2.55
Subsidence	Nil	Nil	Nil	3	1.00	3.00
Drought	Nil	Nil	Nil	3	0.03	0.09
Earthquakes	Mod.	Low	Low	60	0.07	4.20
Termites	Nil	Low	Nil	12	1.00	12.00
Epidemic	Low	High	High	210	0.03	6.30
Mold	Low	High	Mod.	150	0.02	3.00
Haz Mat Spills	High	Mod.	Mod.	180	0.01	1.80
Nuclear Accidents	High	High	High	300	0.01	3.00
Civil Unrest	Mod.	Low	Mod.	90	0.02	1.80
Terrorism	High	High	High	300	0.01	3.00

The greatest threats to people during a single event are nuclear accidents, terrorism, hurricanes, tornadoes, and epidemics. However, over the long run, the “people score” shows that greatest continuous threats are lightning, wind from tropical storms and hurricanes, nuclear accidents, and termites.

3.21.3 Impact on University Operations

Similar calculations were done to determine which hazards have the most affect on university operations. The subjective statements of nil, low, moderate, and high impact were converted to numerical values of 1, 10, 40, and 100 to produce a single event value. These scores are multiplied times the frequency of occurrence to produce an “impact” score. The “impact” scores have no discrete meaning. They are used to compare the listed subjective values between hazards.

Table 3.24 below displays that levee break flooding, hurricanes, tornadoes, and terrorist attacks will have the greatest impact on University operations. However, when factoring in the likelihood of occurrence, over the long run, the greatest threats to University operations are tropical storms, lightning, and hurricanes.

Table 3.26 Summary of impact on university operations

Hazard	Impact on University operations	Number Score	Frequency	Impact Score
Minor Flooding	nil	1	1.55	1.55
Major or Hurricane Flooding	high	100	0.02	2.00
Wind – Thunderstorms	nil	1	2.18	2.18
Wind - Tropical Storm	low	10	0.40	4.00
Wind- Cat 1 Hurricane	moderate	40	0.13	5.20
Wind- Cat 2 Hurricane	moderate	40	0.05	2.00
Wind- Cat 3 Hurricane	high	100	0.03	3.00
Wind- Cat 4 Hurricane	high	100	0.01	1.00
Wind- Cat 5 Hurricane	high	100	0.006	0.60
Wind - Tornado	high	100	0.28	28.00
Hail	nil	1	0.57	0.57
Lightning	low	10	0.59	5.90
Storm Surge	high	100	0.09	90.00
Winter Storms	low	10	0.05	0.50
Subsidence	nil	1	1.00	1.00
Drought	nil	1	0.03	0.03
Earthquakes	low	10	0.07	0.70
Termites	nil	1	1.00	1.00
Epidemic	moderate	40	0.03	1.20
Mold	moderate	40	0.02	0.80
Haz Mat Spills	low	10	0.01	0.10
Nuclear Accidents	moderate	40	0.01	0.40
Civil Unrest	moderate	40	0.02	0.80
Terrorism	high	100	0.01	1.00

3.21.4 Conclusion

The tables and the earlier facts and figures presented in this chapter help prioritize the relative severity of the natural hazards on property and people at UNO's campuses. The Committee concluded the following:

1. Some types of property and areas are more vulnerable than others. For example, buildings that contain basements are more vulnerable to flooding than other buildings. Buildings constructed of cinderbrick are more resistant to water

damage by flooding, yet are more vulnerable to earthquakes than are structures of metal, wooden frame. Arena and frame structures are more vulnerable to wind damage, whereas concrete and steel structures are expected to be the most resistant to structural damage from wind, water, earthquakes, and termites.

2. The hazard causing the greatest amount of destruction in a single event is a wind followed by levee break flooding and terrorism. The hazard that is likely to cause the most property damage over the long run is wind.

3. The greatest threats to people during a single event are nuclear accidents, terrorism, hurricanes, tornadoes, and epidemics. Over the long run, the "people score" shows that greatest continuous threats are lightning, wind from tornadoes and storm surge.

4. Hazards that have high impacts on university operations include levee break flooding, hurricanes, tornadoes, storm surge, and terrorist attacks. Over the long run, the greatest threats to University operations are wind from tornadoes and storm surge.

3.22 References

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CHAPTER 4. MITIGATION ACTION PLAN

For the planning process to be successful, goals are necessary to guide the review of possible mitigation measures. Recommended mitigation actions must be deemed appropriate for all University campuses, reflective of University priorities, and consistent with all other plans. This chapter provides a review of how mitigation goals were set for this Plan, a list of those goals, potential actions and recommended mitigation actions that might achieve those goals.

The culmination of this Mitigation Plan is the action plan. The general direction of the overall program is also outlined in this chapter. Specific activities pursuant to the general direction are detailed in Section 4.4, which assigns recommended projects and deadlines to the appropriate offices.

4.1 GOALS AND STRATEGIES

During a meeting held on May 27, 2011, the goals that were developed on February 20, 2006 by the DRU Advisory Committee for the original UNO Mitigation Plan were reviewed. It was decided that those goals would remain, with some editing to accommodate a more inclusive language that better coordinated with the hazard mitigation plan developed for the satellite locations. The Satellite Campus plan had been developed since the original UNO Plan.

Three general goal statements followed by six general strategies to implement them were used to guide the planning and implementation of mitigation activities and projects. They are as follows:

Goals:

Goal 1. Protect the lives and health of the students, faculty and staff, tenants and visitors.

Goal 2. Protect all University buildings, contents, utilities, and infrastructure from damage by natural and human caused hazards.

Goal 3. Ensure that disruption to the University and tenants' operations during and following an event will be minimal.

Strategies:

1. Protect, strengthen, or retrofit University buildings and facilities so they will suffer little or no damage during an incident and their occupants and contents will be protected.

2. Educate the faculty and staff as well as students and tenants, on ways to protect themselves and their property from damage by natural and human caused hazards.

3. Have the necessary emergency response facilities, equipment, staff, and procedures in place to minimize the danger and damage to people, University property, and the surrounding community during an incident.

4. Have the disaster recovery facilities, equipment, staff, and procedures in place to allow University facilities to reopen immediately after an incident, with minimal reliance on outside sources of assistance.

5. Pay special attention to certain special University resources, including Library holdings, student housing, records, and art collections.

6. Invest resources needed to reach the goals at a level appropriate to the hazard and its impacts on property, people, and University operations.

- **Coordinating Committee**

A plan is of little value if there is no vehicle for ensuring that it is implemented. Therefore, a key long-range strategy is to maintain a permanent Disaster Resistant University (DRU) Advisory Committee to monitor the implementation of the *Plan*, report to the Chancellor on its progress, and recommend revisions to this *Plan* as needed. This is explained in action item 1.

4.2 POTENTIAL MITIGATION ACTIONS/RECOMMENDATIONS

The DRU Research Team along with members of the DRU Advisory Committee identified several hazard mitigation actions that would benefit the University. These recommendations were based on the range of potential mitigation actions which are described throughout this section and are later converted into specific actions in Section 4.3.

4.2.1 Flood Protection

Much of the New Orleans Metropolitan area is built on land that is below sea level. Most of Orleans Parish is ringed with a system of levees. These levees were built to keep the water from the Mississippi River to the south and Lake Pontchartrain to the north out of the densely populated areas. However, these same levees effectively hold rainwater making the metro area susceptible to flooding. Rainwater must be pumped out and over these levees. This is accomplished through the use of a network of surface drainage pipes, open and closed canals, and pumping stations.

The University of New Orleans sits on the edge of the southern shore of Lake Pontchartrain on the east bank of the Mississippi River in New Orleans on land that was created in the 1930s by dredging it from Lake Pontchartrain. Located at the northern boundary of the campus is Lake Pontchartrain's levee. On the western boundary is the London Canal, which has levees now post-Katrina supplemented with floodwalls on both of its banks. Farther into the city on the London Canal levees embedded with flood walls form the protection. These levees and floodwalls are part of the city's hurricane protection system. Because of the location of the Lakefront campus on the artificial land, it is higher in elevation than the neighborhood proximate to it that is on the original lake shore. Campus flood control is an issue, demonstrated by the flood damage to the southwest portion of the campus caused by Hurricane Katrina. Figure 5.1 is a map of the Lakefront campus that shows the depth of Katrina flooding. The darker the blue color, the deeper the flood depth. The southwest end of the campus is most susceptible to flooding as it is the lowest in elevation.

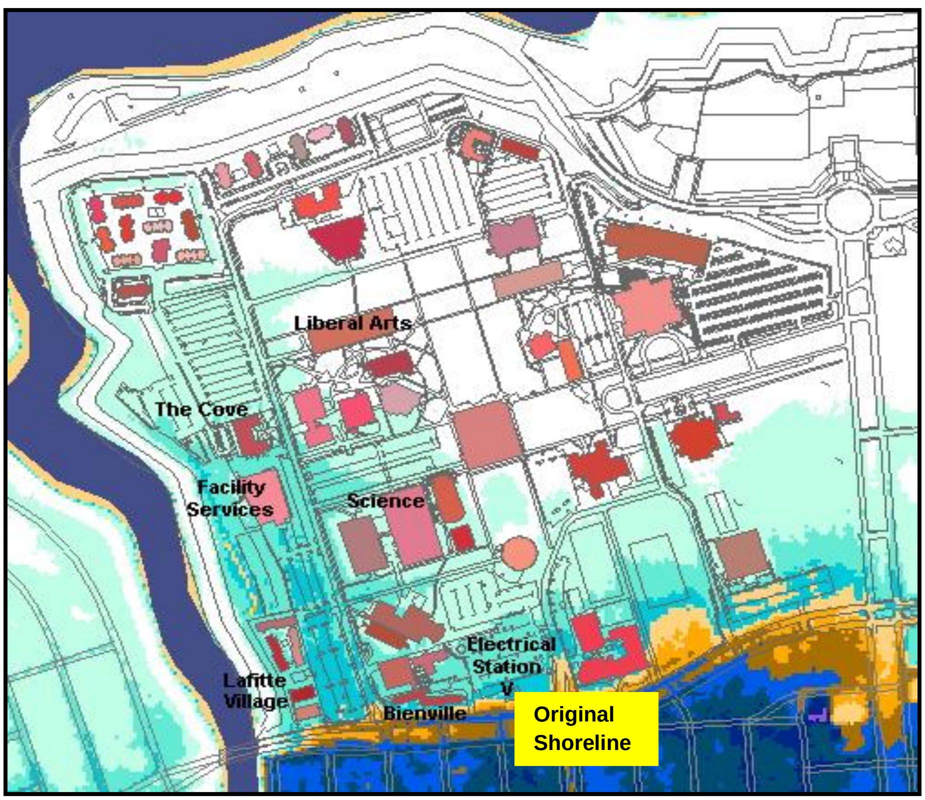

Figure 4.1: Flooding of UNO lakefront campus from Hurricane Katrina

Flooding can be deep and long term, affecting many areas of the metropolitan area. Deep flooding may be caused by storm surge overtopping or breaching the hurricane risk-reduction levee system, such as what happened for the Katrina flooding on the main campus. Levee-failure flooding is projected to occur in the metro area a couple of times per century. On the other hand, shallow flooding can impact localized areas near and on campus for a few hours during and immediately after a heavy rainstorm. High groundwater flooding due to heavy rainfall that temporarily overwhelms the local drainage system can occur more often, with the risk of this type of flooding estimated as once every three years.

- ***National Flood Insurance Program***

Floodplain management practices to include land use, zoning, and enforcement of local ordinances can mitigate flood damages for new construction as well as existing buildings. The National Flood Insurance Program (NFIP), managed by FEMA, plays an important role in the reduction of flood damage in communities across the United States. The NFIP is made up of three components to include flood insurance, floodplain management, and flood hazard mapping. Participation in the NFIP is voluntary and is based upon a community's commitment to adopt and enforce a floodplain management ordinance to reduce future flood risks. This commitment by the community allows the Federal Government to make flood insurance available within the community as a financial protection against flood losses. Orleans Parish is a participant in the NFIP.

- ***Levees and Floodwalls***

The Orleans Levee District and the US Army Corps of Engineers are responsible for the hurricane risk-reduction system: the series of levees that ring the metropolitan area city and protect the University from storm surge referred to in the introduction of this chapter.

The Orleans Levee District[10] was established by Act 93 of the 1890 General Assembly (Legislature) of the State of Louisiana and is primarily responsible for the operation and maintenance of levees, embankments, seawalls, jetties, breakwaters, water basins, and other hurricane and flood protection improvements surrounding the City of New Orleans, including the southern shores of Lake Pontchartrain and along the Mississippi River.

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[10] http://www.orleanslevee.com/

The US Army Corps of Engineers - Team New Orleans[11] provides comprehensive water resources management to include navigation, hurricane and storm damage risk reduction and environmental stewardship for south Louisiana to ensure public safety and benefit the nation. The Hurricane Protection Office (HPO) executes the floodgate and pump station projects, along with levee and floodwall projects on the East Bank in Orleans, St. Bernard and Plaquemines Parishes.

- ***Drainage Improvements***

The Sewerage and Water Board (S&WB) of New Orleans has been serving citizens and protecting the environment since 1899. The S&WB is charged with providing drinking water, sanitary sewer and drainage services for the residents of Orleans Parish. Major improvements to the drainage system made by the S&WB in the last ten years have primarily been in partnership with the Corps of Engineers. The S&WB is responsible for the stormwater drainage system, including the canals, surface drainage pipe network and the pumping stations.

As a result of the extensive flooding in May 1995, Congress authorized the Southeast Louisiana (SELA) Project with enactment of Section 108 of the Energy and Water Development Appropriations Act for Fiscal Year 1996 and Section 533 of the Water Resources Development Act (WRDA) of 1996. This was done to provide for flood control and improvements to rainfall drainage systems in Jefferson, Orleans, and St. Tammany Parishes. Post Katrina, the full SELA funding request of $62.5 million was approved by Congress in the third Supplemental Bill.

The SELA project includes channel and pump station improvements in the three parishes. The channel and pumping station improvements in Orleans Parish support existing master drainage plans and generally provide flood protection on a level associated with a 10-year rainfall event, while also reducing damage from larger events.

Many other drainage projects have been funded and/or completed since Katrina in the metropolitan area. Many were funded through Community Development Block Grant (CDBG) funds and other FEMA programs implemented following Hurricanes Katrina and Rita.

- ***Recommendations***

There is a risk of large scale flooding of the Lakefront campus due to storm surge from a hurricane. This flooding can be caused by the failure or breaching of the hurricane

[11] http://www.mvn.usace.army.mil/aboutus/abt_mission.asp

protection system, the cause of Katrina flooding, or through the overtopping of the city's hurricane protection system from a storm surge greater than that for which it was designed.

The flood elevation in the city and on campus will correspond to the elevation of the water in the lake at the time of the flood event. In order to mitigate this risk, a structural solution can be implemented that keeps the flood waters from the city from entering the campus. This solution consists of creating a secondary levee/floodwall system around the perimeter of the lakefront campus.

This type of structural solution only will prevent flooding of the campus from water rising inside of the city due to a breach or breaches in the levee system away from the UNO campus. However, if storm surge should overtop the Lake Pontchartrain levee, the campus will be flooded, even with a secondary levee system in place.

Two such flood control alternatives were studied. The alternatives consisted of either creating a levee/floodwall or creating a berm.

- ***Levee/Floodwall***

Several flood control projects were identified that modify flooding so that flood water from storm surge does not reach campus buildings and other structures. They include berms that protect more than one building and a levee-floodwall structure that would provide protection to the entire Lakefront campus.

This type of flood control would reduce the risk of flood damage, reduce or eliminate potential mold problems and will allow the University to reoccupy and reopen flood prone buildings so that classes may resume quickly (assuming there is no wind damage to the structures). Caveats include providing escape of water from the campus-side of the berm if the Pontchartrain levee is overtopped and recognizing that such structures would not address wind damage. Wind damage is not addressed in this section. Smaller scale flood control projects are those that provide more localized mitigation. In other words, they affect smaller areas or single buildings.

The first alternative is a campus levee/floodwall system (see Figure 5.2 on the following page). The Lakefront campus, in this scenario, would be bounded on the south and east edges by a levee or floodwall. This system would tie into the city's hurricane protection levee at the northeastern corner of campus and the London Avenue Canal floodwall at the southwest corner of the campus. This levee/floodwall system would protect the lakefront campus to the 100-year flood level, assuming a breach of the lake levee at the crest of the 100-year flood. Of course, protection would not be obtained if the breach occurred in the levee along Lake Pontchartrain on the campus' northern edge. The cost of the campus levee/floodwall system is estimated to be approximately $3.7 million.

Figure 4.2: Limits of campus levee/floodwall (protection from 100 year flood event)

- ***Berm***

The other alternative provides less flood protection. It is called a "berm" to differentiate it from the major levees already protecting the area. Berms are made of fill and should be designed to the same standards as a levee, but they are not intended to be as obtrusive. Berms and levees are wide at the bottom with sloped sides. They can be incorporated into the landscape and made visually pleasing to a certain extent. A "southern berm" would protect the campus from flooding to the same level as the post-Katrina flood. It would run along the southern and southeastern boundary of the campus, as shown in Figure 5.3. The cost of the southern berm was estimated in 2006 to be $0.6 million.

As of 2011, neither of these suggestions has been enacted.

Figure 4.3: Limits of southern berm (providing protection from Katrina-level flood)

4.2.2 Retrofitting

Modifications can be made to the University’s buildings that can reduce damage from future storms and other incidents. Chapters 2 and 3 have identified many potential future events which may negatively impact UNO's mission. Of these, the potential for flooding, high winds, destruction of property by individuals such as terrorists or hurricane victims, and the spreading of mold during extended periods of power outage, have been identified as the greatest concerns. This section discusses types of retrofitting that address each of these hazards.

- ***Flooding***

There are several types of retrofitting projects that can protect buildings from damage by flooding. However, most of these measures are more appropriate for low-level stormwater flooding than for the deeper flooding that would be caused by levee failure.

Some buildings, especially heavily damaged or repetitively flooded ones, are not worth the expense to protect them from future damage. It is cheaper to demolish them and either replace them with new, flood protected structures, or relocate the university activities to a safer site.

All UNO buildings must remain where they are now located, so the campus will not be cleared. Removing individual buildings should only be considered if the building has been substantially damaged or is otherwise not in sound condition. If a building is replaced, it needs to meet all current codes and be protected from the local flood hazard.

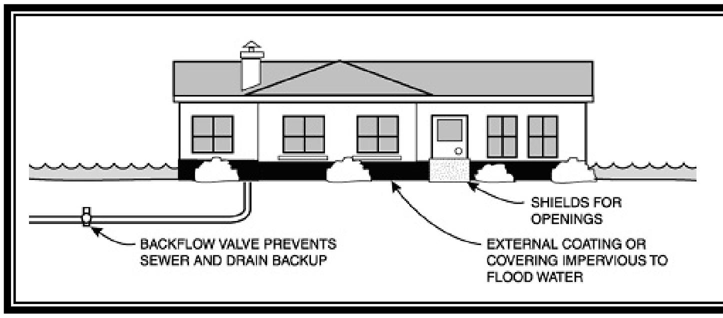
Elevating a building above the flood level can be almost as effective as moving it out of the floodplain. Water flows under the building, causing little or no damage to the structure or its contents. Elevation is generally feasible only where the buildings are relatively easy to elevate and the flood hazard is severe enough to warrant the expense. Due to the size and structural nature of most of UNO's buildings, it is not cost-effective to raise them. However, in some cases, it may be possible to install raised floors in areas that have adequate ceiling height. However, after Hurricane Katrina changes in the design to Pontchartrain Hall South resulted in the structure being elevated 6 feet above the original design in 2007 to reduce the risk of flooding. Additionally, the electrical facilities in Liberal Arts were moved from the basement to a higher elevation.

Dry floodproofing is also a consideration. A building is dry floodproofed by making the walls watertight and ensuring that all openings will be closed when the flood arrives. It is generally only feasible when the following conditions are met: the building is in good shape; shallow flooding; slab-on-grade foundation; and short duration flooding. The most appropriate dry floodproofing design calls for an application of plastic sheeting on the walls. The plastic is covered by facing brick or other material that protects the plastic from puncture or deterioration by sunlight. Such projects have been built in Louisiana.

Dry floodproofed house with facing brick (Baton Rouge)

Floodguards® doorway closure

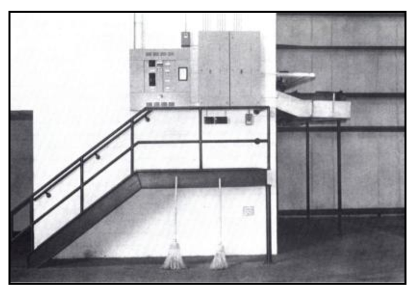
Another concern is the sanitary sewer. Through infiltration and inflow, the sewer lines can become flooded. The line from the building can become a conduit for water in the sewer system. Therefore a backflow valve or other system is needed to prevent overloaded sewers from backing up into the structure.



As with many retrofitting measures, dry floodproofing can have some shortcomings. The most important concern is duration of flooding. There are many ways and places where a waterproofing application can leak. The longer the floodwaters are up and putting pressure on the application, the greater the chance of a leak.

Masonry walls in the New Orleans metropolitan area have weep holes to prevent moisture from building up in the wall cavities. Sealing the walls with plastic sheeting will block these holes. The design must accommodate the need for ventilation within the walls through new, higher weep holes or piping behind the plastic sheeting.

The dry floodproofing approach recommended here requires human intervention, i.e., someone must be present at the site to install the retrofitting measure. This requires warning time before floodwaters reach the structure and someone capable of installing the closures. Because the UNO Facility Services staff is spread thin in the hours before a flood, this can be an important shortcoming, and the number of openings that need to be closed should be kept to a minimum.



Electrical panels elevated above the flood protection level in a wet floodproofed garage.

Wet floodproofing is also a consideration. Under this approach, electrical components, machinery, insulation, wallboard, paneling, carpeting and valuable contents are raised above the flood protection level. The flooded area is remodeled with materials that are not subject to water damage. For masonry buildings, with cinderblock interior walls, the key costs are replacing the floor and doors with flood-resistant materials and coating the walls with epoxy-based paint.

A wet floodproofed structure should have little or no contents subject to damage, or such contents should be kept in spaces above the flood protection level. Therefore, wet floodproofing is not appropriate for residence halls or buildings with much valuable equipment on the first floor.

A floodwall is a barrier around the building, usually constructed of concrete. As with dry floodproofing, all doorways and sewer lines must be closed before the floodwaters arrive. The effectiveness of a floodwall is dependent on the underlying soil. If the ground is too porous, water will seep under the wall and flood the area. The design must also handle rain that falls within the wall. Both concerns can be addressed with interior drainage improvements.

Low floodwall around a senior citizens' apartment building

These include installing subsurface drain tiles (perforated pipes that collect ground water) that drain to a pump. A pump (with a backup power source) pumps the water from the sump to outside the wall.

As part of a Planning Pilot Grant Program (PPGP) activity, seven retrofitting projects were scoped for possible future implementation, several relating to flood retrofitting, including:

- Elevator Flood Mitigation: adding controls to the elevators that have them stop and rest at higher floors, reducing the damage done by first-floor flooding.
- Floodproofing the Engineering Building: Alternatives for scoping much of the first floor, equipment areas or adding a floodwall were scoped, with the floodwall being the preferred method of protection.
- Improved Drainage along Founders Road: Projects were scoped based on a 2000 engineering report suggesting that drainage was inadequate. Partial and full implementations of recommended actions were scoped.

- ***Wind***

Most UNO buildings are fully engineered reinforced concrete low-rise structures. The wind levels required for complete destruction are so improbable that retrofitting to reduce the probability of collapse even further are not likely to be economical. However, window breakage, window seal failure and roof failures, leading to extensive water damage from rain, have been experienced in many buildings and they are not improbable in the future.

Loss of windows has led to destruction of the interior of many UNO buildings. Recent revisions to US building codes require shatter-resistant "laminated" glass in buildings in hurricane-prone areas. It may prove economical to replace the windows and install improved seals, or perhaps apply a film to the windows which will keep them from shattering when hit by "missiles" to reduce the probabilities of these failures.

A number of roof coverings were heavily damaged during Hurricane Katrina and have since been replaced. It probably will not prove economical to remove an otherwise effective roof in order to replace it with a more wind resistant one. However, as roofs are replaced over time due to normal degradation, it would be feasible to spend a little extra to get a more wind-resistant system. In addition, when new buildings are constructed, significant attention should be paid to roof construction and window materials and installation. Annual inspections should also occur to ensure there are no loose parts or appendages which could initiate failure during high winds. While all experts concur that the largest threat to the New Orleans area from a hurricane is the flooding, it must be emphasized that the damage caused by roof and window failure has been significant.

Interior rooms can be reinforced and retrofitted to be windstorm "safe rooms"

One strategy to protect people from high winds has been applied widely in tornado areas. A selected area of a structure is reinforced to resist very high winds. Such a safe room can protect the occupants of the building while a safe building could serve as a means for housing essential campus staff after the area is evacuated.

As part of a PPGP grant, projects for wind retrofitting were scoped for future implementation. These projects include:

- Window retrofitting to the Administration Annex: Consideration was given to high-impact windows, shutters and impact-resistant film.
- Window retrofitting to University Center: Alternatives for window replacement, window shutters and impact-resistant film were scoped for future implementation.
- UCC Safe Area: Scoped and partially enacted was the hardening of the University Computing Center for the purposes of serving as a safe area during an emergency. Changes have been made to include a secondary generator capable of running the entire building, hardening of external walls, conversion of new police headquarters to include living areas, a water separator to keep water from the gas line, and eliminating carpet on the first floor. However, scoping was done

to pursue additional communications capability, window shutters, and foundation hardening.

- ***People***

The threat of attack by a terrorist, criminal, or disgruntled employee/student is always a possibility. The threat of break-ins by hungry and thirsty people displaced by a flood or other disaster has been experienced by the University. Over a thousand evacuees sought protection on the UNO Main Campus after Hurricane Katrina. They entered locked buildings and caused extensive damage. There is also the potential of a riot (or even a victory celebration) that may result in masses of people moving toward or into a University building.

Possible retrofitting measures for the hazards that include people are similar to the measures taken to minimize break-ins by criminals. These include fences, extra locks, and strengthened doors and windows. As with a floodproofing measure, these sometimes require “human intervention,” i.e., someone has to put them in place after the alarm is sounded for them to work.

University buildings have measures considered adequate for a typical individual. However, retrofitting for a determined and heavily armed terrorist or a large mob would be worthwhile only for selected buildings that have a high potential of being a target. Target buildings have been identified since the original plan.

Chapter 3 and the vulnerability assessment indicated that the likelihood of a terrorist attack is very remote for University buildings. However, from time to time, threats may change and terrorists will state that they are targeting university campuses.

- ***Mold***

Mold grows on many different materials in high humidity environments which are not air-conditioned for a long period of time, such as the closed spaces of buildings following Hurricane Katrina. Because some people may be negatively affected by high concentrations of mold spores in the air, mold problems in public facilities are regarded very seriously, generally requiring specialized personnel and equipment for treatment. Further, as noted in Chapter 3, removing mold from University property can prove to be very expensive.

The probability of future mold growth interfering with UNO operations can be reduced by improving back-up power sources to insure continuous air-conditioning. It may also be possible to reduce the use of “mold friendly” materials such as traditional paper-backed sheetrock and particle board in favor of “mold unfriendly materials such a concrete block, concrete board, treated wood and new “sheet rock” materials.

It probably will not prove economical to remove otherwise functional materials simply to reduce the probability of future mold problems. However, some extra expense to utilize mold unfriendly materials in new construction or to replace materials removed for other reasons will likely be justified.

- ***Recommendations***

University officials should further evaluate campus buildings for potential flood retrofitting measures designed to address low level flooding.

A water-proofing specialist should inspect the exterior of each site to identify all possible sources of water infiltration. Evaluate benefits/costs of replacing windows and installing improved seals, or perhaps applying a film to the windows which will prevent them from shattering when hit by large debris during an event.

Building maintenance and replacement procedures should include replacing “mold friendly” materials with “mold unfriendly” materials, including, first-floor carpeting.

University officials should still pursue funding for the UCC safe area on the main campus which could potentially serve the entire University community as well as other scoped projects.

4.2.3 Development and Construction Policies

Development policies are designed to keep future buildings and landscaping up to code. Their objective is to ensure that future development is not exposed to damage and does not increase the likelihood of damage to other properties. Those policies affecting all University of New Orleans’ campuses include the following: building codes, capital improvements, landscaping procedures, and stormwater management rules.

- ***Building Codes***

Since all UNO buildings are state-owned, state building codes are applicable to all future and pre-existing construction. RS 40:1722 establishes the Louisiana Building Code and directs that the following codes be established as the standards as minimum standards for this code: the Life Safety Code, Standard 101, 2006 Edition as published by the National Fire Protection Association; XIV (Plumbing) of the State Sanitary Code as promulgated by the secretary of the Department of Health and Hospitals; the International Building Code, 2006 Edition as published by the International Code Council; the International Mechanical Code, 2006 Edition as published by the International Code Council; and the National Electric Code (NFPA No. 70) 2005 Edition as published by the National Fire Protection Association.

Additionally, the Department of Homeland Security's Federal Emergency Management Agency (FEMA) is encouraging building back stronger and safer after major disasters in communities nationwide. FEMA-funded mitigation and public infrastructure recovery projects — including those in heavily impacted areas of the Gulf Coast region, such as The University of New Orleans, are to be tied to new, higher floodplain elevations updated by FEMA using the most accurate flood risk data available.

Communities recovering from disasters are required to use the new elevations when available. Called Advisory Base Flood Elevations (ABFEs), the height at which there is a one percent or greater chance of flooding in a given year, the rebuilding standards are required for all FEMA-funded mitigation and public infrastructure grant-based recovery program projects. This includes the Public Assistance program, Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant program, Flood Mitigation Assistance program, and through the implementation of Executive Order 11988 Floodplain Management.

For New Orleans, FEMA has determined that eventual levee certification is likely and work on the levees is in the final stages as of 2011. FEMA recommends the following: new construction and substantially damaged homes and businesses within a designated FEMA floodplain should be elevated to either the Base Flood Elevation (BFE) shown on the current effective Flood Insurance Rate Map (FIRM) or at least 3 feet above the highest adjacent existing ground elevation at the building site, whichever is higher; and new construction and substantially damaged homes and businesses not located in a designated FEMA floodplain should be elevated at least 3 feet above the highest adjacent existing ground elevation at the building site.

A Base Flood Elevation (BFE) is the height at which there is a one percent or greater chance of flooding in a given year. It is the minimum building standard of the National Flood Insurance Program (NFIP). Advisory Base Flood Elevations are produced to assist state and local officials and those rebuilding in making decisions on how to reconstruct to help minimize vulnerability to future flood events.

The FEMA Flood Insurance Rate Map designates the campus as an AO Zone, with a base flood depth of 1.5 feet above ground level. It therefore would be currently regulated to the ABFE. The FIRM assumes that the lakefront levees will hold during a 100-year flood. If they failed at the crest of a 100-year flood, the campus would be inundated by water up to 18 feet above sea level. Such flooding would be much deeper than was witnessed following the post-Katrina levee breaches, where flood depths reached 3 feet above sea level.

New construction on campus also follows the Life Safety Code (NFPA 101), the American with Disabilities Act, and applicable ordinances in the City of New Orleans.

- ***Capital Improvements***

A capital improvement plan will guide a community's major public expenditures for the next 5 to 20 years. Capital expenditures may include acquisition of open space within the hazardous areas, extension (or withholding) of public services into hazardous areas or retrofitting existing public structures to withstand a hazard.

- ***Landscaping Procedures***

Falling trees or limbs cause hundreds of millions of dollars of damage each year, as well as personal injury or death in the most extreme cases. Since trees are particularly subject to damage by wind, ice, and snow storms, downed trees and branches break utility lines and damage buildings, parked vehicles and anything else under them. An urban forestry program can reduce the damage potential of trees.

Urban foresters or arborists can select hardier trees which can better withstand high wind and ice accumulation. Lack of proper maintenance, particularly pruning, is a contributing factor in massive damage caused to the region's urban forest and power interruptions and threats to public safety. Individual species are also a major factor in the amount of storm damage. The older and larger the species of tree, the more brittle the wood and limbs tend to fail with less external stress than younger more pliant trees.

By having stronger and more native trees, programs of proper pruning, and on-going evaluation of the trees, universities can prevent serious damage to their tree populations. A properly written and enforced urban forestry plan can reduce liability, alleviate the extent of fallen trees and limbs caused by wind and ice build-up, and provide guidance on repairs and pruning after a storm.

University plant selection has been based on the hardiest, most drought tolerant plants available to survive the University's lack of overall irrigation. This is a collective decision formulated by the University Grounds Manager, Campus Master Planner/Landscape Architect, and Facility Services. Tree selection is different from plant selection. Before Hurricane Katrina, the above offices had to re-think guidelines for the survivability of trees that would be replaced on campus. Trees such as Bradford Pear, Mimosa, Drake's Chinese Elm, and Southern Magnolia trees did not survive the extreme winds from Hurricane Katrina nor the salt content of the flood waters. Trees that were able to weather the storm with little or no damage were Bald Cypress, Pine Cypress, Crepe Myrtle (depending on duration of submersion), Live Oak, Savannah Holly, Water Oaks, and tropical palm trees.

- **Stormwater Management**

The basic University stormwater management guidelines for its main campus are simple: terrace and slope to the street whenever possible. UNO has a swale that extends ½ the perimeter around its main campus. Water is sloped to this swale, and it carries the runoff to an underground culvert. It then enters a City storm drain. The remaining storm water runoff enters area drains, located throughout the campus, which are also tied to the City of New Orleans' storm drain system.

New construction in floodplains can be protected from overbank and coastal flooding by floodplain regulations. The University of New Orleans sites are subject to stormwater flooding, as well as flooding from potential levee breaks.

There are three main ways to prevent flooding problems caused by stormwater runoff:

- Ensure that new developments have adequate storm sewers and/or drainageways to carry the water away;
- Require new developments to hold their excess runoff on site, so it will not overload the existing drainageways; and
- Set construction standards so buildings are protected from shallow water.

Because most of New Orleans metropolitan area is flat and surrounded by levees protecting it from Lake Pontchartrain and the Mississippi River, rainwater cannot flow out by gravity. It has to be pumped out. The City of New Orleans has 22 drainage pumping stations and 13 underpass pumping stations that pump water out of the city and into Lake Pontchartrain or canals. Flooding will occur if there is more rainfall than the City's or the Parish's drains and pumps can handle. Generally, the pumps can handle about one-half inch to one inch of water per hour for the first few hours. A tropical storm or hurricane may drop several inches per hour, quickly overloading the man-made drainage system.

Another factor contributing to the vulnerability of University buildings to shallow surface floods are clogged storm drains. The inlets become clogged with leaves, grass clippings, mud, trash and other debris, preventing storm water from flowing into the large, underground collection boxes that are part of the surface water drainage system.

When a new building is constructed on UNO's campus, the drains from the building are tied into the existing drainage system and the size of the drain lines are increased if necessary. New buildings have area drains in applicable plazas, patios, and any other paved area that is constructed. Roof drains located every 500 square feet handle storm water runoff from rooftops and is carried via roof drains which are directly tied into underground storm drains. These drains on campus are then fed into the City's storm drain located at the University's property line.

When grass is converted to a new parking lot, drains are also tied into the existing drainage system. Parking lots require a certain number of area sub-drainage per square yard, foot, or acre. Where the drainage system looks like it might be overloaded, storage space would be designed on the new parking lot to store the water before it goes into the drainage system. A civil engineer designs these stormwater management systems.

One change since the previous Plan includes upgrading drainage in unpaved lots along Perimeter Road. The incorporation of a sub-drainage system into these lots on the main campus have helped to reduce groundwater flooding due to the overflow of the storm drainage system.

- ***Recommendations***

University-wide development policies should be reassessed in light of the lessons learned from recent storm events. These policies should ensure that future development is not exposed to damage from a storm at least as strong as Katrina and does not increase damage to other properties. However, the University is part of the state's higher education system and thus, it is held to the procedures dictated by the state.

Through the incorporation of DRU Advisory Committee members on a number of sitting planning bodies, there are a number of hazard mitigation goals integrated into other existing University plans, and a number of plans directed toward hazards. The Advisory Committee should make sure that this effort continues.

Any additional or replacement landscaping should continue to be limited to those species of plants and trees that are able to withstand damaging effects of high winds and flooding. Selection of the hardiest, most tolerant greenery should continue to be planted on all campus sites to act as a buffer where possible.

4.2.4 University Emergency Operations

Threats to the University requiring an emergency response can be divided into two basic categories: lead-time events and rapid-onset events. Lead-time events are those for which there is advance warning and consequent time for thorough preparations. Rapid-onset events, in contrast, are more difficult to respond to and prepare for due to their "surprise" nature. A third category of hazards is not related to events that require emergency operations. These include subsidence, drought and termites.

- ***Lead-Time Events***

Hazards that fall into this category include major meteorological events such as tropical storms, winter storms, and hurricanes. Storms of this magnitude present the greatest material threat to the University under most circumstances and a potential for loss of life in the absence of adequate preparation. Events such as these affect the entire university and require the coordinated action of all relevant entities. The following hazards are considered lead-time events: hurricanes and tropical storms that cause flood and wind damage, storm surge, winter storms, epidemics and mold.

Since hurricanes are the most significant lead time event requiring emergency response that the university is likely to face, much effort has been made, in light of recent experience, to assemble the appropriate leadership team. To this end, the Chancellor of the University New Orleans has designated the Vice Chancellor for Campus Services as the Plan Coordinator of the UNO Hurricane Emergency Plan.

During the emergency period, the Plan Coordinator has supervisory responsibility over departments and personnel who comprise the Hurricane Emergency Preparedness Team (HEPT) and Hurricane Emergency Implementation Team (HEIT). All recommendations of the HEPT and HEIT must be relayed by the Plan Coordinator to the University Chancellor for his approval.

The following positions comprise UNO's Hurricane Emergency Preparedness Team (HEPT) and are responsible for making recommendations during the pre-season preparation, threat assessment, class cancellation, and university closure stages.

- Provost and Vice Chancellor for Student and Academic Affairs
- Vice Chancellor for Campus Services
- Vice Chancellor for Enrollment Management
- Vice Chancellor for Research and Sponsored Programs
- Dean of Library Services
- Dean of Student Affairs
- Assistant Vice Chancellor for Public Safety
- Assistant Vice Chancellor for Accounting and Procurement
- Assistant Vice Chancellor for International Education
- Associate Vice Chancellor for Auxiliary Services
- Associate Vice Chancellor for Facilities and Operations
- Chief Information Officer
- Chief Marketing & Communications Officer
- Compliance Officer
- Director, Athletics

- Director, Auxiliary Services
- Director, Environmental Health and Safety
- Director, Human Resources
- Director, Privateer Place
- Director, Purchasing Department
- Director, Student Housing

The following positions comprise the **Hurricane Emergency Implementation Team (HEIT)** and are responsible for implementing specific detailed procedures for their area of responsibility. Each team member may require additional staff under his/her supervision to assist in the implementation of the Hurricane Emergency Plan.

- **Vice Chancellor for Campus Services (Plan Coordinator).** In charge of overall plan coordination and implementation.
- **Vice Chancellor for Enrollment Management.** Manages all aspects of term calendarization which includes, registration, fee payment schedules and adjustments where needed to academic calendars.
- **Assistant Vice Chancellor for Accounting and Procurement.** Manages all efforts of Financial Accounting Operations, including Purchasing.
- **Assistant Vice Chancellor for Public Safety.** Manages all aspects of UNOPD preparation and response.
- **Associate Vice Chancellor for Academic Affairs and Fiscal Administration.** Provides information dissemination to both campus and off-campus departments.
- **Associate Vice Chancellor for Facilities and Operations**. Manages all efforts of Facility Services as the campus deals with storm preparation and recovery issues.
- **Chief Marketing & Communications Officer.** Updates Emergency Information Center within SharePoint and the UNO website. Provides information dissemination to the local media and updates the 504-280-6000 main switchboard number with information for the general public.
- **Chief Information Officer.** Manages all aspects of the University Computing and Communications system. Provides support to the Chief Marketing and Communications Officer and the Plan Coordinator as needed.
- **Compliance Officer**. Activates and manages Business Continuity Plans (BCP) to ensure critical department/college functions resume during extended evacuation periods when re-population of the campus is necessary.
- **Dean, Student Affairs.** Manages all aspects of Student Affairs, including: Disabled Students, Health Services, and Judicial Affairs, throughout emergency.
- **Director, Athletics**. Manages all aspects of the Intercollegiate Athletic department, athletes, game schedules and athletic facilities throughout emergency Associate Vice Chancellor for Academic Affairs and Fiscal Administration. Provides information dissemination to the different campus departments and buildings. Reminds all departments about disseminating this information to all off campus locations.
- **Director, Auxiliary Services (Food Services, Housing).** Manages all efforts for food services and housing units as the campus deals with storm preparation, student evacuation, and storm recovery issues.
- **Director, Environmental Health and Safety**. Liaison between the University and emergency agencies such as Red Cross and New Orleans Office of Emergency Preparedness. Provides weather, evacuation, and other emergency information as it becomes available.
- **Director, International Students and Scholars.** Oversees contact with and evacuation plans of International Students in all departments. Provides dissemination of information to this group.

These groups of decision-makers are responsible for guiding the university through the range of actions required to protect the lives of students, faculty and staff; to physically prepare the university and to bring it back to full function in the least amount of time.

In order to disseminate the necessary information to all concerned parties, the Chancellor has designated the Chief Marketing and Communications Officer as the official source of university announcements. This office will post official information on the UNO switchboard 504-280-6000, make announcements via campus-wide email, and communicate with local TV and radio news programs. Information may also be distributed through the University's Alert System e2campus, that sends emergency information to students and staff through email and via text message for all those who have signed up for the free service. Current information will also be available at WWNO, UNO's public radio station.

Emergency and essential personnel are required to monitor the University's Emergency Information Hotline as well as the Emergency Information Center (EIC) found on UNO's Sharepoint site.

The University of New Orleans has developed a Hurricane Emergency Plan that includes general guidelines for all students, faculty and staff, in the event of a tropical storm or hurricane.

The Plan is divided into 5 stages. The action steps indicated in the stages may or may not be taken within the stages listed, depending on the circumstances of the storm and time of day in which the storm occurs. In addition, the Plan Coordinator may declare a change in stage at any time due to the unpredictable nature of hurricanes.

- **Stage 1. Pre-Season Preparation** This stage is focused primarily on having students, faculty and staff devise their own Personal Emergency Plan. It also includes a list of sources of information to help individuals develop their plans and remain informed of the progress of events.
- **Stage 2. Threat Assessment** Stage 2 begins when the Director of Environmental Health & Safety sees that a weather pattern is elevated to tropical storm status and poses possible danger to Louisiana. This stage marks the beginning of the implementation of the hurricane plan and consists of various levels of information gathering and sharing. It is also during this stage that the HEPT makes a decision regarding class cancellation and/or evacuation, generally some 72 hours before predicted landfall.
- **Stage 3. Class Cancellation** At this point non-resident students are instructed to initiate their evacuation plan. All required employees are likewise instructed to remain on campus until discharged by their supervisor. Once it has been verified that all buildings have been evacuated and secured, the university moves to Stage 4.
- **Stage 4. University Closure** During Stage 4 all faculty and staff (with the exception of critical emergency personnel specifically designated by the Chancellor to maintain campus security and physical plant operations) are required to leave campus after discharging their responsibilities under the plan. The Student Housing Campus Evacuation Plan is initiated during this stage.

- **Stage 5. Aftermath** The final stage of the plan deals with damage assessment, recovery, reopening, and return to classes. This stage is divided into four phases: In *the Damage Assessment stage,* post-emergency response teams will come to the campus and inspect the facilities to make sure it is safe for other employees and resident students to return to the UNO Campus. In the *Recovery stage***,** the essential university personnel are allowed back onto the campus to begin cleaning up and preparing their areas to be open to the public. In the *Reopening stage***,** all other University Personnel and resident students are allowed on campus to finalize cleanup and prepare for the opening of the university. In the *Return to Classes stage***,** the University resumes its normal operations.

- ***Rapid-Onset Events***

Rapid-onset events include both natural and man-made disasters. These events can affect the entire university or a smaller part thereof. All pose a greater threat to life than storms or other hazards that provide advance warning. Rapid-onset events include: thunderstorms that cause stormwater flooding, minor wind damage, hail and lightning; tornadoes; earthquakes; dam failure; hazardous materials spills; nuclear accidents; civil unrest and terrorism.

Building coordinators are the main contact point for information dissemination in each building. They also keep an eye out for safety deficiencies in their buildings. In the case of an evacuation building coordinators are the designated person to ensure that the building is evacuated. They are also the point person in an evacuation, i.e., fire or bomb threat, that receives the reports from the different offices in the building on the conditions of those other offices and transmits that information to the authorities as required. Pre-storm preparations require building coordinators to walk around the exterior of their building and identify dangerous situations then report them to Facility Services or take care of it them themselves.

Building coordinators are appointed by the administration. Usually it is one of the highest ranking persons in that building. The building coordinators receive no extra compensation for their extra duties; thus, people may not be eager to accept this responsibility.

Tornadoes. At present, the University has no means of protection against tornadoes other than the general instruction to seek safety in an interior room of a significant structure. The Weather Service does issue tornado advisories that can provide up to 15 minutes warning time in which many people can get to safety. Although there is a campus-wide emergency warning system comprised of the e2campus text messaging system and an emergency warning siren, the system is located on the main campus in terms of tornadoes, but can be heard off campus as well, including at the Research and Technology Park and the Lake Oaks neighborhood. A new siren has been installed on the main campus. WWNO also monitors the National Weather Service's severe weather warnings.

Hazardous Materials Spills. A threat from hazardous materials can take three basic forms: accidental release of materials, release of larger quantities of toxic material on nearby railway lines or by a truck on adjacent roadways, or the intentional release of materials due to a terrorist attack.

If toxic chemicals were released by a train derailment or a truck on the Interstate, the University has to rely on the City of New Orleans to inform them of the incident. It is unknown how quickly this notification would occur. However, University officials can receive alerts via text message from NOLAReady, the New Orleans Community Alert System and/or UNO's e2Campus. In addition, review by University officials of the notification plan that currently exists for the City of New Orleans and the railroad system would give the University more awareness of the most effective way for the building to respond.

In instances where sudden evacuation is not possible due to the rapid arrival of the chemical cloud, there is the need to alert the building to "shelter in place." As mentioned, there is a campus-wide alert system with the addition of a second siren on campus. UNO's e2Campus could be used to alert the University community. However, only University faculty/staff and students are allowed to register with e2Campus. Tenants and visitors will have to rely on building managers communicating message throughout their respective buildings.

Civil Unrest. Perhaps the biggest unforeseen issue in the Katrina experience involved the appearance on campus of large numbers of people from the surrounding flooded neighborhoods. As UNO sits on higher ground, this was a natural occurrence. However, these survivors broke into campus buildings and not only took what they needed to survive, but some engaged in looting and vandalism.

In some buildings the monetary damage was greater than that caused by the storm. These events took place because there was no building for a sufficient number of emergency personnel to remain during the storm and no plan in place to provide necessary supplies and services to the evacuees.

From an emergency response perspective, having only two police officers on campus in the immediate aftermath was inadequate. One of the issues here is where to safely house such security/safety personnel during a storm. Another issue is the degree to which critical personnel remaining on campus could talk to outside agencies in the event of total failure of normal means of communication, assuming that the campus was physically cut off as it was during Hurricane Katrina.

The Louisiana National Guard did ultimately arrive to help provide supplies restore order and evacuate survivors but there was a period of communications blackout. If there had been fail-safe communications ability, and a prior plan to coordinate with outside agencies, damage to the university could have been lessened.

Terrorism. Terrorism can come in many forms. Explosive devices, toxic chemicals or biological compounds and firearms can cause massive loss of life if employed by a determined individual or group.

Bomb "threats" are an unfortunately common occurrence on many University campuses, often called in by individuals with a grievance or simply by those wishing to avoid a deadline of some sort. However, since the detonation of a bomb in a building has the potential to cause great loss of life, all bomb threats must be treated seriously. The University has detailed bomb threat procedures for both those receiving the phone threat as well as for safety personnel.

As discussed above, terrorist attacks can come in many forms. It may not be feasible for the university to fully protect itself from every possible type of attack. In the case of a bomb threat, the university is relatively well prepared. In the case of a Columbine type incident or a sniper lodged on the roof of a tall building, the University police rely on city or parish SWAT teams. Some members of the UNO Campus Police department have been trained in SWAT and would most likely be first on the scene in response to an event.

- ***Recommendations***

Expand use GIS of (Geographic Information Systems) to provide location (including photos, video, etc.) data to assist firefighters and HAZMAT personnel. First responders could have at their fingertips the location of any hazardous materials as well as the locations of critical infrastructure such as electrical shutoffs, water valves, etc.

Prior coordination between the University and outside first response agencies such as the NOPD should lead to more effective emergency responses.

Ensure that there is adequate training/information dissemination such that, when the campus alert alarm sounds, people know what to do.

Encourage faculty/staff and students to register cell phones and email addresses on E2Campus (http://ucc.uno.edu/notification/) for the emergency text messaging system.

This system allows you to receive immediate notification of emergency situations such as school closures, etc. Review the possibility of allowing tenants of off-campus sites to register. Encourage building coordinators to also register with the Orleans Parish emergency alert systems as well.

Conduct further review of security measures (cameras, motion activated lights, open access to building during the day; open parking lots and parking too close to building, lack of perimeter fencing). Also, review current emergency plans for inclusion of potential acts of campus violence. Additionally, violence prevention programs should be investigated.

4.2.5 University Operations

All major operational components of the University must be examined in order to develop a comprehensive mitigation program. Teaching, both in a classroom and online, research, management functions, information technology, and student services are all vital to the University in fulfilling its mission.

The University also relies on the continuity of utilities such as electricity and water. The loss of such services can completely shut down University services and must be prevented. Even in the case of a disruption to operations, such as an evacuation for a storm, continuously functioning utilities are vital for short-term recovery and resumption of University business processes. The guaranteed presence of electricity allows buildings to be maintained at an optimum temperature and prevents the loss of property which is vital to both education and research.

Continuity of University operations should be carefully planned and such planning usually takes the form of a Business Continuity Plan. A Business Continuity Plan (BCP) is a tool used by the various departments in an organization to ensure the swift resumption of normal operations following a disaster event. Some universities have elected to purchase software or hire a consulting firm to create their BCP. A BCP might include any of the following: identification of mission critical functions, a Business Impact Analysis, a Risk Reduction Survey, Maximum Acceptable Outage for business processes, and a prioritization of functions. All units at UNO are required to have a BCP, which is stored on Sharepoint. This is a new requirement since the 2006 hazard mitigation plan, and should help see to the continuance of operations in the event of an emergency.

Post Emergency Response teams perform a damage assessment on University buildings as soon it is feasible to return after an emergency event. They inspect the facilities (all buildings, grounds, and utilities) to determine a timeframe for other employees and resident students to safely return to the affected UNO site. The Post Emergency Response Teams report any unsafe campus conditions to the Highest Ranking Officer of UNO Police. This officer communicates with the Chancellor of the university to inform him of the status of that campus. If the campus is deemed safe, a decision is made on proceeding with reopening the campus. Essential personnel are allowed onto the campus for clean up and preparation of the area to be opened to the public. All remaining individuals such as university personnel, tenants and resident students return to the area for reopening.

Since Hurricane Katrina, many improvements are under way to assist in improving the resumption of university operations after a disaster. Plans for some improvements were under way pre-Katrina, whereas others began in light of Hurricane Katrina. For example, the University Computing and Communications Department has developed a “mirror” site or “hot” swappable center for mission critical computer systems. The site is located on the LSU Baton Rouge campus at the Frey Computer Center. This backup location has hardware and software identical to that used on the main campus. Using synchronization software will keep these systems updated in real time so that at a moment’s notice the university can switch computing functions from the main campus to the backup site. The switching process can take anywhere from five to 30 minutes to complete. Approximately 25 backup servers are being maintained at the Frey Computer Center. The following systems have been identified as mission critical functions: Domain Controller, DNS Server, Web (UNO Home Page), E-mail (MS Exchange for faculty, staff and students), PeopleSoft Learning Solutions (HR/Payroll/Student Administration), and PeopleSoft Financials (General Ledger, Purchasing, Payables).

In addition to improving redundancy of computer systems, UCC has also established redundant network links to the servers located in Baton Rouge and the main campus. These links have been established with two independent communication providers and therefore take two different paths from campus to Baton Rouge. Additionally, the university has two Internet service providers and has increased communications bandwidth to the off campus servers from forty-five megabits to one-hundred megabits.

The university also has a natural gas generator in the computer center capable of running all servers, network equipment and air conditioning units located in our computer room. This will allow for survival through intermittent power outages and provide for the ability to run computer systems without depending on the city’s electric service provider.

The University has installed two emergency sirens on campus that will alert anyone on campus that an emergency has been declared. The University is in the process of upgrading alert systems inside buildings to give more robust information about the nature of the alert and what actions are expected.

Other plans for improvements being discussed involve administrators and critical staff having one satellite phone and additional cell phone numbers with outside area codes so that if an instance such as Katrina occurs, where cell phones in the retrospective area did not work, the person could still be contacted through additional contact numbers. Wireless cards, in addition to other software, and notebooks/laptops are being considered for staff so that they may bring their work with them in the event of an evacuation. In addition, University Computing and Communication is working towards having two toll-free telephone numbers to allow students, faculty, and staff to call the university. The additional telephone line will be for essential personnel to retrieve information.

- ***Recommendations***

The University and its units should continue to consult the BCPs they have developed to make sure that all plans are up-to-date.

The University should continue to upgrade the UCC to serve as an emergency operations center in the event of a disaster.

The University should continue to develop hazards-based plans like those that have already been developed. These plans should be reviewed to make sure they are up-to-date.

4.2.6 Information and Education

Developing Public Information projects is the first step in the process of orienting students, faculty and staff to the hazards they face and the concept of mitigation. Projects should be designed to encourage people to seek out more information in order to take steps to protect themselves, the University, and their property.

Research has proven that outreach projects are effective. Information can bring about voluntary mitigation activities at little or no cost to the University. However, awareness of the hazard is not enough; people must also be told what they can do to protect themselves from the hazard. Projects should include information on safety, health, and property protection measures.

Research has also shown that local programs are more effective than national advertising or publicity campaigns. Therefore, outreach projects should be locally designed and tailored to the University community.

Messages used as part of Public Information projects may be tailored to the target audience. The types of messages appropriate for students depend on the student's particular situation (e.g., disabled students, students residing in campus housing, students from outside of the New Orleans Metropolitan area, international students, students without transportation, etc.).

Faculty and staff are charged with the protection of the University's property. They must be trained on how to back up information systems, protect valuable items, and safeguard their own belongings. Currently, faculty and staff do not receive much guidance from the University. Some departments may have policies in place for faculty, but the University, as a whole does not. Certain critical staff members are tasked with protection measures prior to a storm event, such as clearing debris. These tasks are outlined in the Hurricane Action Plan found on the university web site. However, this plan appears to only be used by Facilities Services.

Visitors from outside of the area may be without transportation and be unfamiliar with the evacuation process. These individuals should be advised to alter their travel arrangements, if possible, to exit the area prior to a mandatory evacuation. Visitors may require transportation to the airport, or information on evacuation routes if they will be driving out of the area. At the present time, no information is available specifically for visitors.

Public information campaigns can include various forms of media including handouts, newsletters/mailings, websites, news media, WWNO, campus presentations, signs, etc. Brochures can be made available in administrative buildings and the library, or in other high traffic areas where students, faculty/staff, tenants and visitors are likely to notice the materials. Signs, located around campus in high traffic areas, can also serve to inform those individuals who both notice and read them. Signs providing evacuation and hazard information are not currently in place on the campus.

The most effective types of outreach projects are mailed or distributed to everyone in the community. A school paper, like UNO's *Driftwood*, may reach the entire University community. A website, such as the University's website, can also be an effective means of providing information to all University stakeholders. One advantage of providing information over the Internet is that it can be easily accessed by anyone with a computer and a connection. Parents outside of the New Orleans metropolitan area can easily look for updates and access the same information as the students themselves.

However, it is critical that the information on the website is easy to locate and access. Faculty/staff and students can currently access some disaster preparedness information on the UNO website. This information can be found on the UNO Environmental Health & Safety website. A Hurricane Preparedness / Action Plan, and a guide to protecting personal information are both available.

Local newspapers can be strong allies in efforts to inform the public. Press releases and story ideas may be all that is needed for their interest. After a tornado in another community, people and the media became interested in their tornado hazard and how to protect themselves and their property. Local radio stations and cable TV channels can also be helpful. These media offer interview formats and cable TV and may be willing to broadcast videos on the hazards.

WWNO, the local radio station operated by The University of New Orleans is implementing a plan to continue broadcasting during a disaster event. This radio station will be able to deliver important information to students, and other individuals, within the Greater New Orleans Area.

Presentations at meetings of University groups, particularly around orientation, can also be an effective form of outreach. At the present time, few such presentations are made. Some information is given during both Freshman Orientation and the International Student Orientation.

Overall, there are many ways that public information can be used so that students, faculty/staff, tenants and visitors will be more aware of the hazards they face and how they can protect themselves. University staff can implement many of the proposed public information activities. By formalizing its activities, a University can ensure that all individuals receive proper and adequate information.

- ***Recommendations***

Safety workshops should be held during student orientation. All student, faculty, and staff should be provided with wallet sized cards containing safety information as well as a detailed evacuation list. The University shall work with Student Government to develop activities during National Preparedness Month, September, to engage students and provide them with important information.

Safety workshops for on-campus residents should be continued. These classes are currently instructed by Facility Services personnel.

The University's webpage should include mitigation information in addition to the emergency plans already listed.

Mitigation information is part of the curriculum for the UNIV 1001: University Success class required for all new incoming students and should remain a requirement.

4.3 Action Items

The Research Team along with the Advisory Committee identified several hazard mitigation actions that could benefit the University. These recommendations were based on a range of potential mitigation actions described in section 4.2. The recommendations were categorized according to areas of mitigation including flood protection, retrofitting, development and construction policies, emergency operations, university operations, and information and education.

Specific action items were then recommended based on the general recommendations stated in section 4.2 and with five factors in mind: hazards that pose the greatest threats, appropriate measures, costs and benefits, affordability, and environmental impact. Section 4.4 lists the 15 action items that address the major hazards, are appropriate for those hazards, are cost-effective, are affordable and have minimal negative impacts on the human and natural environment. The last section of the chapter addresses how these action items are to be implemented along with the adoption and revision of the mitigation plan.

Fifteen action items were identified in the update. Fourteen of these actions originated in the 2006 plan; one new action (number 15) was added. No action items from the 2006 Mitigation Plan were deleted during this Update. These Action Items directly relate to the goals and strategies previously discussed in this chapter. The following chart is a summary of the items, including current status.

Table 11-1 Action Item Summary

	Goals			Strategies						
Action Item	1. Protect lives and health	2. Protect buildings and infrastructure	3. Continuity of University operations	1. Strengthen buildings and facilities	2. Educate faculty, staff and students	3. Emergency response capabilities	4. Disaster recovery capabilities	5. Attention to special resources	6. Invest appropriate resources	**Status**
1. DRU Advisory Committee	x	x	x	x	x	x	x	x	x	Ongoing
2. Drainage system evaluation		x		x					x	Ongoing
3. Retrofitting measures	x	x	x	x					x	Ongoing
4. Safe building/floor/area	x	x	x	x		x	x	x	x	Ongoing
5. Target building evaluation	x	x	x	x		x		x	x	Ongoing
6. Development policies evaluation		x		x				x	x	Ongoing
7. Master Plan reassessment		x	x	x				x	x	Expanded/Ongoing
8. Building and GIS data	x	x	x	x		x		x	x	Ongoing
9. Emergency operations procedures	x		x			x	x	x	x	Ongoing
10. University Emergency Communications	x		x		x	x	x	x	x	Expanded/Ongoing
11. Business continuity plan			x				x	x	x	Ongoing
12. Hazard protection education	x	x	x		x	x			x	Ongoing
13. Hazard protection information projects	x	x	x		x	x			x	Ongoing
14. Increased Use of Online Learning			x		x				x	Ongoing
15. Violence Prevention / Mental Health	x		x		x			x	x	New

Action Item 1. Maintain Permanent DRU Advisory Committee

In May 2007, members of the original DRU Advisory Team agreed to participate in the DRU Advisory Committee on a permanent basis. This Committee should be maintained. Duties of this Team include:

- act as a forum for hazard mitigation issues,
- disseminate hazard mitigation ideas and activities to all participants,
- monitor the incorporation of this *Plan* into other planning mechanisms,
- monitor implementation of this *Plan* and

- report on progress and recommended changes to the Chancellor.

The Committee does not have any powers over University offices or staff. It is purely an advisory body. Its primary duty is to collect information and report to the participating offices and the Chancellor on how well this *Plan* is being implemented. The DRU Advisory Committee is, in effect, UNO's hazard mitigation conscience, reminding the offices and staff that they are all stakeholders in the *Plan's* success. While it has no formal powers, its work should act as a strong incentive for the offices responsible for the action items to meet their deadlines. Members of the Committee include:

- Academic Affairs & Fiscal Administration
- Auxiliary Services
- Campus Services
- Environmental Health and Safety Office
- Facility Services
- Jefferson Center
- Lakefront Arena/CERM
- Ogden Museum
- Public Safety
- Student Affairs
- Technology and Economic Development
- University Advancement
- University Computing and Communication
- University Police
- University Relations & Campus Services
- University Student Housing
- CHART, *Ad hoc* and staff support

In addition to the above listed duties, the Committee should continue to consider whether other individuals or groups should be invited to participate and to nominate new committee members when appropriate. The Committee should also continue attempts to include student leaders in the Mitigation Planning Process.

Responsible Agency: UNO-CHART will assist the Vice-Chancellor of Campus Services in facilitating meetings and drafting required reports.

Deadline: Annual progress reports are due on the anniversary of the date the *Plan* is adopted. A five year-update is required for continuing credit of this *Plan* under FEMA's mitigation funding programs.

Cost: Staff time.

Benefits: Those responsible for implementing the various recommendations have many other jobs to do. A monitoring system helps ensure that they don't forget their assignments or fall behind in working on them. The *Plan* should be evaluated in light of progress, changed conditions, and new opportunities.

The end result will be an up-to-date and effective collection of mitigation activities that will reduce the University's exposure to the hazards.

Hazards Addressed: All 17 hazards, natural and human-caused listed in the hazard identification and analysis.

Status: Ongoing -- Between adoption and the end of the five-year update cycle, one annual report was produced. During the five years, the committee met regularly and was in contact as they created and adopted a hazard mitigation plan for the satellite campuses, scoped PPGP projects, and hosted a national Disaster-Resistant University Conference with the Louisiana Governor's Office of Homeland Security and Emergency Preparedness. Being regularly engaged, additional reports were deemed unnecessary. Efforts on this action item should continue.

Action Item 2. Drainage System Evaluation

An overall review of the surface and subsurface parts of the drainage system will be conducted to ensure that all storage and conveyance facilities are designed and maintained to minimize flood damage to buildings. This review will include an evaluation of:

- On-site retention of stormwater in low areas and in parking lots, and
- The costs and benefits of a formal swale maintenance program.

In addition, a database of recent and planned drainage projects, maintenance procedures, and system needs will be developed to assist in the planning efforts for this action item.

Responsible agency: Campus Services/Facility Services (Vice Chancellor)

Deadline: Ongoing process as new construction and/or paving projects take place.

Cost: Staff time.

Benefits: Over the years, the surface drainage system has filled in and deteriorated. Storm sewer inlets have become clogged with debris. Although Facility Services has completed an evaluation of the drainage system, this follow-up evaluation will include a review of the surface drainage system that conveys stormwater to the storm sewers. The result will be a drainage system that handles the largest amount of stormwater at the least expense and prevents damage to buildings and other infrastructure.

Hazards Addressed: Floods (Minor/Major/Hurricane/Levee Failure), Winter Storms.

Status: Ongoing -- An evaluation of the drainage system is conducted with each new construction project. As new projects and paving activities are conducted, this evaluation will continue. Recent upgrades include improvements in sub-surface drainage and swales along Perimeter Road.

Action Item 3. Retrofitting Measures

Buildings that were damaged by recent storms will be (1) retrofitted with appropriate floodproofing measures and/or (2) retrofitted with appropriate wind retrofitting measures. The retrofitting projects may be funded as mitigation actions under various FEMA programs.

At this stage, some projects have been implemented, but there are seven projects that have been scoped, and pursuit of resources to implement these projects now becomes the priority for this Action Item, but new retrofitting items could be identified as their need is identified. The projects were identified based on weaknesses discovered during Hurricane Katrina, and were studied for feasibility using the STAPLEE method. These projects include:

- Installation of wind-resistant storm window tracks and paneling on the exterior of the Administration Annex ($53,931)
- Installation of wind-resistant storm window tracks and paneling on the exterior of the University Center ($243,202)
- Construction of a Floodwall and Floodgate system around the exterior of the Engineering Building. ($1,016,500)
- Improving elevators in four buildings that would keep the cabs from returning to the first floor if it were flooded ($75,000)
- Implementation of recommended changes in the drainage of Founders Road. ($908,400)
- Retrofitting the University Computing Center so that is can serve as a safe building. This action includes new actions to the building, including installation of wind-resistant windows, and upgrading emergency communications. ($80,635)
- Purchase and installation of emergency generators. ($400,000 each)

Responsible agency: Campus Services, Vice Chancellor

Deadline: Target completion date for all projects is 2011-2016.

Cost: To be determined as projects are fully scoped. Estimates for current scoping included in parentheses following project descriptions.

Potential Funding Source: Local/State budget, FEMA (HMGP, PDM)

Benefits: Each building will be protected from the type of damage caused by Hurricanes Katrina/Rita/Gustav.

The actual benefits of each project will vary, but at a minimum, FEMA's benefit/cost software will be used to demonstrate that the benefits exceed the costs over time.

Hazards Addressed: Floods (Minor/Major/Hurricanes/Levee Failure), Wind(Tropical Storms, Hurricanes, Tornadoes, Thunderstorms), Storm Surge, Winter Storms.

Status: Ongoing -- Several mitigation projects at the UNO Lakefront Arena have been undertaken. The roof has been upgraded to a modified bitumen system, and can now withstand 135 mph winds. Similarly the fascia and "sloped roof" have been upgraded. The sloped roof was manufactured on premises and was installed on top of the old slope roof, improving insulation and mitigating against wind hazards. A new air conditioning system will dehumidify the air, preventing structural damage in the aquatics center caused by the circulation of chlorinated air. Efforts were also made to replace certain contents of the Arena with water-resistant materials (e.g., plastic lockers, mold resistant seat fabric, etc.). Several other potential mitigation projects have been scoped and are ready to be submitted when grant funding is available for retrofitting activities. These projects include wind and flood retrofitting projects discussed above.

Action Item 4. Safe building/Safe Room/Safe Floor

The University will design and construct a "safe building/room/floor" that will function as the "University Disaster Management Center". It will perform multiple functions. It will:

- Be built to withstand Category 5 winds and the 500-year flood,
- House an emergency operations and communications center,
- Provide shelter to a cadre of University emergency management and public safety staff during extreme events,
- Consider the possibility of housing emergency operations staff from the City and relevant agencies, so there will be an auxiliary City emergency operations center during emergencies (in the UCC Safe Area), and
- House a generator large enough to power emergency services in campus buildings to enable the University to continue operating after a storm or evacuation.

If community residents come onto campus to seek safety, the University will facilitate the flow of evacuees to a designated area for temporary shelter. The designated area will serve as a pick-up point for public authorities to evacuate these residents to a safer location out of the area.

In addition, increased collaboration between the city, these public authorities, and UNO officials will be required. Collaboration should involve discussions that include these public authorities possibly residing in the University Disaster Management Center at UNO.

Responsible agency: Campus Services (Vice Chancellor / Campus Police Chief).

Deadline: Target completion date is 2011-2016.

Cost: Initial scoping estimated at $80,635.

Potential Funding Source: Local/State budget, FEMA (HMGP, PDM)

Benefits: The Campus Disaster Management Center will provide protection to the Campus from the type of damage that interrupted university operations after Hurricane Katrina.

It may help to accomplish this task by having adequate staff available during and after an event, problems created by evacuees or intruders can be prevented and post-disaster clean up can proceed faster. The University Disaster Management Center will have a secure source of power, which will allow for the control of temperature and humidity in buildings. This may help to avoid or reduce the tremendous expense of mold remediation. FEMA's Hazard Mitigation Grant Program requires that the University demonstrate that the benefits of the project exceed the costs over time.

Hazards Addressed: Floods (Minor/Major/Hurricanes/Levee Failure), Wind(Tropical Storms, Hurricanes, Tornadoes, Thunderstorms), Hail, Lightning, Mold, Earthquakes, Storm Surge, Civil Unrest.

Status: The University Computing Center has been hardened to a degree, and operates on separate generators during an emergency. The University Police have moved to the building, which can be converted into a command center during an emergency. The command center includes sleeping and eating facilities, and has some retrofitting for wind and flood resilience. Additional retrofitting projects are being scoped as part of FEMA's Planning Pilot Grant Program.

Action Item 5. Target Building Evaluation

In this plan, there are eight buildings identified on UNO's main campus that would be likely targets for terrorists, vandals, protesters, and others wanting to do damage to campus structures and operations. Earlier sections of this plan identify additional buildings that may be considered targets as well. Each of these performs a different function and would offer a different opportunity for an attacker.

All University buildings should be prioritized to identify an order in which buildings should be evaluated based on the types of hazards to which each may be vulnerable. Each will be evaluated separately to determine where they are vulnerable and to identify appropriate retrofitting or other protective actions.

Members of UNO Police have received training related to construction/landscaping techniques and homeland security. Facility Services should continue to coordinate with these individuals to assist identifying/scoping future retrofitting projects, and consider if the list of target buildings should be updated over time

Responsible agency: The Department of Public Safety, University Police in conjunction with the Environmental Health and Safety Office and Facility Services (Police Chief/Environmental Health & Safety Officer).

Deadline: Annually.

Cost: Staff time.

Benefits: The eight (and possibly other) target buildings offer attackers opportunities to do great damage to the University and its operations. The evaluations will identify the best way(s) to defend against such attacks. Individual recommended retrofitting projects will be reviewed to ensure that they are cost-effective.

Hazards Addressed: Civil Unrest, Terrorism.

Status: Ongoing -- University Police conduct target-area walk-throughs each Thursday to identify possible hazards, including burned-out lights and low-visibility areas. Concerns are reported to Facility Services for correction. These walk-throughs should continue and the list of target buildings re-evaluated over time.

Action Item 6. Future Development and Construction Policies

The University has a variety of development and construction policies and procedures that govern how sites are developed and improved. These will be reviewed to incorporate the following:

- Building maintenance and replacement procedures to include: provisions for replacing windows and roofs with appropriate wind and mold resistant materials and technology, or to provide for the stability of structures in the instance of an earthquake,
- Standards for construction of new buildings to include stronger wind, hail, and water standards than required by current state codes, and standards for construction considering subsidence of the land,
- Landscaping guidance to focus on those species of plants and trees that are able to withstand the damaging effects high winds, flooding, and drought, and
- Landscaping guidance to identify the best locations for trees and plants to act as buffers against wind.

Responsible agency: Campus Services/Facility Services (Vice Chancellor)

Deadlne: Two years from adoption of this *Plan*.

Cost: Staff time.

Benefits: The measures listed above are relatively inexpensive approaches to mitigate low intensity hazards. They can be incorporated into ongoing programs and policies to ensure that only cost-effective approaches are included. The result will be better protection of all campus' buildings and facilities at minimal additional cost.

Hazards Addressed: Floods (Minor/Major/Hurricanes/Levee Failure), Wind (Tropical Storms, Hurricanes, Tornadoes, Thunderstorms), Storm Surge, Hail, Lightning, Winter Storms, Subsidence, Earthquakes, Drought

Status: Ongoing – A number of changes have been made in planned landscaping and construction activities because of knowledge gained during Hurricanes Katrina/Rita/Gustav. Among these changes are shifts to more hearty trees that better withstand drought, winds and flooding, and elevating Pontchartrain Hall South 6 feet higher than initially planned. As a state-run facility adoption or higher regulatory standards is controlled by the state, but the Advisory Committee continues to look for areas to incorporate mitigation where possible.

Action Item 7. Master Plan Reassessment

All University plans, including the Capital Outlay Plan, the Strategic Plan, and the Institutional Effectiveness Plan, will be reviewed annually in light of the annual report produced by the DRU Advisory Committee. At this time, appropriate mitigation projects and other plan elements should be considered for inclusion in these planning documents.

Responsible agency: Campus Services/Facility Services (Vice Chancellor)

Deadline: Annually.

Cost: Staff time.

Benefits: Close coordination of the University's capital expenditures with its mitigation objectives will ensure that future construction will be appropriately protected from hazards. For example, new buildings in the area flooded following the Katrina levee breaks can be elevated above the flood level.

By having a flexible and responsive capital outlay program, the University can better react to its immediate needs and opportunities that arise from recent disasters. Before large amounts of funds are spent, each project will be reviewed to ensure that the construction will be disaster resistant.

Hazards Addressed: Floods (Minor/Major/Hurricanes/Levee Failure), Wind(Tropical Storms, Hurricanes, Tornadoes, Thunderstorms), Storm Surge, Hail, Subsidence, Earthquakes, Terrorism.

Status: Expanded -- The original Plan only called the Advisory Committee to coordinate with the Capital Outlay Plan. Since then, the Committee has realized that there are a number of plans that should be considered for coordination including the Strategic Plan. DRU Advisory Committee members sit on the committees on these plans and continue to integrate mitigation activities where appropriate. Committee members serve on the committees that develop these plans. Both the specific goals and hazard mitigation, in general, have been incorporated into these plans. For example, the Strategic Plan sets goals related to emergency awareness and alerts, incorporating hazard mitigation in rebuilding efforts, upgrading the electricity in the UCC, ensuring redundancy of the network, and incorporating disaster planning into the business continuity plan for all units. There are now 11 plans or guides related to emergency procedures, including a Disaster Emergency Plans, a Hurricane Plan, Communications Plan and a University Services Resumption Plan.

Action Item 8. Building and GIS Data

There is a wealth of information on the buildings, facilities and infrastructure on campus. However, a majority of the information is not in a format readily usable by police, fire and other emergency personnel. Most building floor prints have been collected, scanned and located on Sharepoint, in addition to basic attributes to those buildings. Under this project, this work will continue and information will be collected, catalogued, organized, and provided in formats that first responders need. The data will include:

- Ground and rooftop entries and exits,
- Electrical and gas shutoffs,
- Water valves,
- Ductwork and utility corridors,
- Valuable and abnormal contents, such as computers and animal colonies,
- Hazardous materials and chemicals,
- GIS locational data of these components, and
- Photos and videos to assist first responders in navigating a dangerous situation.

Responsible agency: CHART in coordination with the Department of Public Safety, and the New Orleans Police and Fire Departments.

Deadline: As resources become available, the building diagrams should be converted to an integrated GIS. Target completion date is 2011-2016.

Cost: Potential software costs and staff time. Additional funds would need to be obtained.

Potential Funding Source: Local/State budget

Benefits: The Building and GIS data will provide information on structural aspects, infrastructure, and contents, in effect addressing almost all natural hazards. The target building evaluations (Action item 5) will identify the key features of campus buildings and facilities that are of interest to first responders. After these key buildings are evaluated, the rest of the campus will be inventoried. The result will be very useful data that can facilitate response to a variety of hazard events, especially fires, power outages, hazardous materials accidents, terrorists, snipers and other people threatening lives or property. The benefits in lives, property and University down time could be immense.

Hazards Addressed: Floods (Minor/Major/Hurricanes/Levee Failure), Wind(Tropical Storms, Hurricanes, Tornadoes, Thunderstorms), Storm Surge, Hail, Lightning, Winter

Storms, Subsidence, Earthquakes, Termites, Epidemics, Mold, Hazardous Materials Spills, Nuclear Accidents, Civil Unrest, and Terrorism.

Status: Ongoing -- While the goal of this item is to have a fully integrated GIS for first responders, this task has not been fully completed. Now, on Sharepoint, there are digitized floor plans for every floor in every building on campus. However, this information has not been integrated with a GIS at this time.

Action Item 9. Emergency Operations Procedures

The University has several different plans for different hazards, emergencies, and contingencies. Under this action item, they will be reviewed, coordinated, and augmented as appropriate to include the following:

- Improved coordination with City and State emergency management offices,
- Monitoring NOAA Weather Radio and City police frequencies in addition to agency alerts to provide early warning of an incident or weather event,
- Specific response actions for different hazards,
- Improved evacuation instructions,
- Provisions for sheltering students, especially foreign students, during and following an event,
- Identification of additional equipment and supplies that may be needed by campus first responders, such as chemical protective suits, radiation detectors, and night vision devices,
- Operating procedures for an emergency operations center,
- Training and exercises for all affected personnel, and
- Distribution of the procedures to all appropriate parties on and off campus.

Responsible agency: University Police and Environmental and Health Safety Office under the Department of Public Safety

Deadline: Should be done annually as Emergency Plans are updated annually.

Cost: Staff time.

Benefits: Emergency operations procedures that have been carefully prepared, that are based on all available data on the hazards and their potential impact, that utilize the latest planning and management tools, and that are regularly exercised will greatly improve the University's disaster response capabilities.

Better disaster response means less loss of life, injury to people, damage to property, and/or disruption of university operations.

Hazards Addressed: All 17 hazards, natural and human-caused listed in the hazard identification and analysis.

Status: Ongoing -- A number of procedures have been developed for individual hazards, and this process is ongoing. A Memorandum of Understanding has been signed with Northwestern State University in Natchitoches for the housing of on-campus students in the event of an evacuation. Additionally, some University Police staff have undergone advanced training.

Action Item 10. University Emergency Communications System

Investigate ways to enhance the current emergency communications system. Examples include incorporating the use of social media. The University should continue to provide training to faculty, staff and students on the System as it develops. All stakeholders must be informed of the system components, when the system will be activated and how to react when the system is implemented. The University should continue to test the system periodically.

Responsible agency: University Police/Environmental and Health Safety Office/Communications Office (Vice Chancellor of Campus Services)

Deadline: Training and testing can be done on a quarterly basis.

Cost: Staff time to design the system and provide training.

Benefits: Early recognition of a tornado, hazardous materials spill plume, nuclear accident, civil unrest, or other rapid onset hazard can save lives and prevent property damage. For example, five minutes of warning of a tornado or lightning would give authorities time to issue an order for everyone to seek shelter indoors. This will augment the fire alarm system which is only indoors and which instructs everyone to go outside.

Hazards Addressed: Tornadoes, Hazardous Materials Spill, Nuclear Accident, Civil Unrest, Terrorism, Winter Storms, Floods (Minor/Major/Hurricanes/Levee Failure), Wind (Tropical Storms, Hurricanes, Tornadoes, Thunderstorms), Storm Surge, Hailstorms, and Lightning.

Status: Ongoing/Expanded -- The University has established a three-level system to identify an impending hazard as early as possible and to issue warnings appropriate to the situation. Continued and increased success will require awareness and encouragement of participation from faculty staff, students and guests. A *series of radios* provides the initial level of preparedness, allowing relevant staff to communicate and initiate preparedness or response activities. At the second level, the University has enrolled in the *e2campus alert system* that allows faculty, staff, students and guests to enroll for emergency messages by text message and/or email. A final level of warning is issued through *warning sirens or emergency alarms*. Since the initial plan, two shelter-in-place sirens have been installed on campus. These sirens cover campus and nearby neighborhoods and indicate that a shelter-in-place emergency has been declared for the area. Examples would include a tornado warning or an armed gunman. Sirens are tested on the Friday or the second week of each semester. Notification is posted on campus and through the email and e2campus alert system.

The University continues to pursue improvements to the public address system to deliver pertinent information after emergency alarms are sounded. It is also exploring ways to integrate social media into the emergency communications system.

Action Item 11. Business Continuity Plan

The University will create a University-wide Business Continuity Plan (BCP) to serve as an asset in the disaster recovery process by ensuring that the University can continue mission critical functions. The creation of the BCP will require (1) the identification of mission critical functions along with the resources and costs it will take for their continued execution (2) the creation of a Business Impact Analysis (BIA), and (3) the creation of a Risk Reduction Survey (RRS).

The BCP will also involve the designation of key officials to a designated temporary operations center. Officials will know what they need to bring with them to the center in the event of a disaster. Copies of the BCP will be kept by key department members and at the designated temporary operations center.

BCPs created by individual departments are to be updated annually. Training on department BCPs should also take on an annual basis/

Responsible agency for development: CHART

Responsible agency for implementation: Academic Affairs/Office of the Chancellor

Deadline: Continue to update and promote familiarity with established BCPs annually. Identify resources to develop and implement a university-wide BCP prior to the 5 year update of this Plan in 2016.

Cost: Staff time.

Benefits: A BCP will assist in Short Term Recovery and help to ensure that the mission critical functions of the university are allowed to continue in the event of a hazard. It will also help to ensure the long term viability of the University as an institution.

Hazards Addressed: All 17 hazards, natural and human-caused listed in the hazard identification and analysis.

Status: Ongoing -- While an umbrella BCP has not been developed, it is now a requirement that each University unit have on Sharepoint a BCP for their unit. Familiarity and updates must be encouraged.

Action Item 12. Hazard Protection Education

A short training course on the hazards faced on campus and the appropriate safety and property protection measures will be developed. Students will be required to take the course. The course will also be offered to faculty and staff. New faculty and staff should receive information at their orientations, in addition to students, who should receive information at new student orientations. CHART in partnership with Academic affairs will continue to work together to distribute emergency management information at orientations.

Responsible agency for content development: CHART

Responsible agency for implementation: Academic Affairs (Provost)/Campus Services (Environmental & Safety Officer)

Deadline: Fall Semester 2012 during UNIV 1001: University Success course. *Cost:* Staff time.

Cost: Staff time.

Potential Funding Source: Local/State budget

Benefits: An educated student body will be a safer student body. Students (and participating faculty and staff) will know how to protect their computers, vehicles, and homes from damage and what they can do to prevent or minimize problems on campus (e.g., keep storm drain inlets cleared). The end result will be a knowledgeable population who will take steps to protect themselves, their belongings, and campus property at minimal cost to the University.

Hazards Addressed: All 17 hazards, natural and human-caused listed in the hazard identification and analysis.

Status: Ongoing -- A University Success course has been added for all incoming freshman. Efforts are being made to incorporate more hazard preparedness information into this class. Additionally, funding from the Governor's Office of Homeland Security and Emergency Preparedness has allowed incorporation of hazard preparedness and mitigation to be incorporated into more University curriculum. A hazard mitigation minor is under development and a certificate has already been developed under Public Administration. Additional opportunities to expand knowledge of hazards and mitigation actions are being explored.

Action Item 13. Hazard Protection Information Projects

Each year, the DRU Advisory Committee will institute a series of projects to advise faculty, staff, and students about hazard safety and property protection. These will be reminders for those who have taken the hazard protection course. Examples of such projects include:

- Providing all faculty, staff, and students with a small wallet card with safety information,
- Providing all faculty, staff, and students with an evacuation checklist,
- Providing hazard and mitigation information on the University's webpage, along with links to related sites,
- Selling pre-packaged disaster supply kits in the University bookstore,
- Observing National Preparedness Month (September) with special activities, such as a remembrance of Hurricane Katrina and the launching of new public information projects,
- Separate orientations for those who are residing in student housing or in the temporary trailer parks, and
- Making evacuation maps available to all students, staff and visitors.

Responsible agency: PIO in conjunction with the Department of Public Safety, CHART, and Human Resources.

Deadline: Additional projects will be drafted within one year of adoption of this *Plan*.

Cost: Staff time.

Benefits: The projects will reinforce other campus, city, state, and federal efforts to inform people about the hazards and ways to protect people and property. The end result will be a knowledgeable population who will take steps to protect themselves, their belongings, and campus property at minimal cost to the University.

Hazards Addressed: All 17 hazards, natural and human-caused listed in the hazard identification and analysis.

Status: Ongoing -- No staff course has been developed, and while the DRU Advisory Committee did provide an information table to some events, this is an area that stands out as an area that needs improvement. Hazard mitigation emphasis areas provide opportunities for interested students, and course offerings expand opportunities for education, but basic information made available to all students, faculty and staff can be improved.

Action Item 14. Increased Use of On-line Learning

The University will develop a plan to increase the continuity of university operations, particularly the continuance of classes in the event of a hazard. This plan will encourage more faculty and students to learn how to use UNO's web-based learning tool. Shells are already established for each class on Moodle, and can be converted to online through that format. The University continues to explore the expansion of online-only alternatives, which will encourage familiarity with the format.

Responsible Agency: Academic Affairs in conjunction with University Computing and Communication (Provost/Vice Chancellor).

Deadline: These efforts are under way. Progress should be made within one year of the plan.

Cost: Staff time.

Hazards Addressed: All 17 hazards, natural and human-caused listed in the hazard identification and analysis.

Status: Blackboard has been upgraded to Moodle and many classes are now online only. The University Senate formed a committee to explore additional integration of online learning which has led to efforts to expand online-only formats as well. This process is ongoing.

Action Item 15. Violence Prevention / Mental Health

It is recommended that current policies and procedures should be reviewed in an interdisciplinary, collaborative fashion that includes all pertinent campus participants. After review, an integrated, comprehensive Action Plan should be developed by the participants and distributed to the entire university community through all available communication systems. It should be emphasized that current on-campus resources for student and staff services are limited and strained, and costs for implementing new and/or expanded programs must be considered. Other suggestions for further discussion include:

- promoting and utilizing community hotlines for immediate assistance;
- maintaining the existing committee to review all known information about the individual of concern and to assess the risk for the individual and the campus. Currently this team meets once a month unless additional meetings are necessary.
- developing a training program for faculty/staff/student in the identification of potential warning signs, “red flag” behavior, and related procedures;
- establishing a university wide protocol to communicate and share information regarding individuals who exhibit behaviors of concern. This project is underway, and an online reporting form is being developed in accord with best practices in developing the specific wording.
- promoting information about the UNO Employee Assistance Program and other referral resources to faculty and staff;
- re-establish the UNO Workplace Violence Committee.
- working with other state institutions to establish a state-wide campus security task force (see http://www.dps.mo.gov/CampusSafety/index.htm).
- Members of the safety team have received specialized training in threat assessment that is geared toward higher education. Extending this training to other pertinent faculty and staff should be considered.
- joint training for all agencies involved in implementing the system
- ensuring that handling incidents of campus violence is addressed in campus emergency response plans.

Responsible Agency: Student Affairs (Associate Dean-lead), University Police, Student Counseling Services, University Counsel, Student Accountability and Advocacy

Deadline: A comprehensive review of the current policies, procedures, and programs designed to address mental health and campus safety should be conducted regularly and updated every five years. Meetings should continue to be conducted monthly or more frequently, as needed.

Benefits: To better identify and get help for those members of our University community who may pose a danger to themselves or to others in hopes of preventing acts of violence.

Cost: Staff time to evaluate current system and make recommendations.

Hazards Addressed: Civil Unrest, Terrorism (to include Campus Violence)

Status: This is a new item from the satellite plan, and some progress has been made, including regular meeting by the Campus Safety Committee and advanced training for members of that committee.

4.4 IMPLEMENTATION AND PLAN MAINTENANCE

This *Plan* will be implemented upon its adoption by the Chancellor. The action items will be implemented by the designated responsible agencies. Representative of these agencies have reviewed this *Plan* and have agreed to take on the work. They will report their progress to the DRU Advisory Committee, led by the Vice Chancellor of Campus Services.

The designated responsible agencies will each develop criteria upon which the respective action item will be implemented. Based on the set criteria, a progress report will be developed to evaluate the implementation that action item on a regular basis. From the time of adoption of the plan until the Committee meets, the responsible party for each action item shall coordinate with others, as necessary, in implementing their assigned action items.

The DRU Advisory Committee, led by the Vice Chancellor of Campus Services, will meet annually following adoption of this *Plan*. At each meeting, the participants will review University, City and State mitigation developments and report on the progress toward implementing their assigned action items. Each of the participants will present his or her individual progress report for each action item.

On the anniversary date of adoption of this *Plan*, the Chair of the DRU Advisory Committee will submit a progress report to the Chancellor. This report will review:

- Any hazard events or incidents that occurred during the year.
- A review of the action items, including how much was accomplished during the previous year.
- A discussion of why any action items were not completed or why implementation is behind schedule.
- Recommendations for new projects or revised action items.

The annual progress report will be provided to all DRU Advisory Committee members and posted on the University's website for review and comment. An email to this effect will be sent to all UNO faculty, staff and students as well as outside agencies and neighborhood associations mentioned in Chapter 1 of this Plan. A public meeting will be held to present the annual progress report and to allow for public input. Offices responsible for implementing affected plans, policies and procedures, such as the *Capital Outlay Plan* and others mentioned in Chapter 1 and Action Item 7 will ensure that their work is consistent with the University's mitigation efforts.

The DRU Advisory Committee, led by the Vice Chancellor of Campus Services, will assign a specific schedule for updating the Plan within the five-year cycle as FEMA requires. The goal will be to submit a draft Mitigation Plan to GOHSEP and FEMA for a formal review approximately 1 year prior to the expiration date of this Plan.

Within that cycle, the DRU Advisory Committee will prepare a *Mitigation Plan Update.* The *Plan Update* will include:

- A review of the *Plan*, the original planning process, and how the *Update* was prepared,
- A review of new studies, reports, and technical information and of the University's needs, goals, and plans that have been published since this *Plan* was prepared,
- Revisions to Chapters 2 and 3 that account for:
    - New floodplain maps or hazard information,
    - New construction on campus,
    - Major incidents or disasters that occurred since this *Plan* was adopted,
    - New flood control or property protection projects, and
    - Any other change in conditions and/or development exposed to the hazards covered in this *Plan*.
- Recommended revisions to the *Plan* to account for projects that have been completed, dropped, or changed and for changes in the hazard and vulnerability assessments, as appropriate. It may also adopt new goals, strategies or action items.

During the update process and again upon completion of the draft Update, the Plan will be distributed for public review and comment in the same manner followed for the public review of this *Plan* (announcement of meetings/invitation to comment via email message and *The Times-Picayune*). Upon approval by the Advisory Committee, the Update will be submitted to FEMA for approval through the State. Following approval by FEMA, the Update will be submitted to the Chancellor for adoption by the University

4.5 References

Association of American Universities, August 2007, "Survey on Safety on AAU Campuses after the Virginia Tech Shootings."

Association for University and College Counseling Center Directors (AUCCCD), 2007, "Statement on State Governors Task Force."

Langford, Linda, The Higher Education Center for Alcohol and Other Drug Abuse and Violence Prevention, Funded by the U.S. Department of Education, "Preventing Violence and Promoting Safety in Higher Education Settings: Overview of a Comprehensive approach."

Appendix A: NCDC Thunderstorms in Orleans Parish

The following chart shows the National Climatic Data Center's Thunderstorm events from 1950 until May 2011. There were 134 events. Not all events affected UNO.

Date	Time	Winds	Property Damage
4/28/1958	100	0 kts.	0
12/31/1960	730	63 kts.	0
6/10/1961	1340	50 kts.	0
2/25/1964	0	50 kts.	0
4/25/1964	1800	55 kts.	0
7/8/1965	1400	50 kts.	0
1/28/1966	2130	0 kts.	0
4/21/1966	1000	0 kts.	0
4/28/1966	1340	50 kts.	0
6/17/1966	1830	0 kts.	0
7/3/1967	2027	60 kts.	0
5/24/1968	1645	0 kts.	0
7/12/1968	1030	50 kts.	0
2/1/1970	1439	90 kts.	0
2/1/1970	1445	0 kts.	0
7/4/1970	1508	75 kts.	0
11/13/1970	2200	0 kts.	0
4/2/1971	40	58 kts.	0
3/2/1972	525	51 kts.	0
5/12/1972	1748	50 kts.	0
6/22/1972	1230	52 kts.	0
12/30/1972	2227	50 kts.	0
4/26/1973	603	60 kts.	0
5/11/1974	130	0 kts.	0
1/10/1975	1230	70 kts.	0
3/18/1975	628	52 kts.	0
4/30/1975	1140	53 kts.	0
4/30/1975	1751	71 kts.	0
8/26/1975	1312	52 kts.	0
5/10/1976	1145	64 kts.	0
5/24/1976	1711	55 kts.	0

Date	Time	Winds	Property Damage
5/31/1976	1551	55 kts.	0
7/31/1976	704	0 kts.	0
7/2/1977	1900	60 kts.	0
12/13/1977	1745	68 kts.	0
6/29/1978	902	50 kts.	0
6/29/1978	2202	50 kts.	0
8/20/1978	1630	0 kts.	0
4/11/1979	1300	0 kts.	0
5/4/1979	1057	52 kts.	0
5/29/1979	1710	52 kts.	0
7/1/1979	1700	0 kts.	0
7/16/1979	1753	50 kts.	0
8/6/1979	1936	58 kts.	0
6/24/1980	1214	65 kts.	0
7/7/1980	1638	55 kts.	0
2/10/1981	540	65 kts.	0
4/30/1981	1540	0 kts.	0
6/1/1981	600	0 kts.	0
6/22/1981	1405	0 kts.	0
7/10/1981	1920	0 kts.	0
7/30/1981	1818	0 kts.	0
1/31/1982	200	0 kts.	0
6/16/1982	2000	0 kts.	0
8/8/1982	1342	0 kts.	0
8/9/1982	1342	50 kts.	0
9/24/1982	2030	0 kts.	0
2/21/1983	1117	68 kts.	0
8/10/1983	1420	50 kts.	0
12/11/1983	445	0 kts.	0
12/27/1983	2302	0 kts.	0
2/12/1984	1320	74 kts.	0
2/12/1984	1320	75 kts.	0

Date	Time	Winds	Property Damage
2/12/1984	1345	61 kts.	0
2/12/1984	1350	53 kts.	0
7/25/1984	1330	0 kts.	0
2/11/1985	155	52 kts.	0
2/23/1985	0	0 kts.	0
5/21/1985	1235	0 kts.	0
8/1/1985	1430	50 kts.	0
7/13/1986	1640	0 kts.	0
7/16/1986	1645	0 kts.	0
5/6/1987	2050	0 kts.	0
5/21/1988	1140	0 kts.	0
5/4/1989	1830	0 kts.	0
11/15/1989	1607	55 kts.	0
5/27/1990	1800	0 kts.	0
5/27/1990	1825	0 kts.	0
9/4/1990	1900	54 kts.	0
9/4/1990	1943	72 kts.	0
4/18/1991	345	0 kts.	0
4/11/1995	556	60 kts.	0
4/11/1995	630	0 kts.	0
4/11/1995	642	60 kts.	0
5/8/1995	2125	0 kts.	750K
5/8/1995	2133	50 kts.	250K
5/9/1995	2235	70 kts.	0
11/11/1995	605	52 kts.	0
1/24/1996	219	53 kts.	0
2/13/1997	110	0 kts.	1K
4/26/1997	304	57 kts.	50K
4/26/1997	410	54 kts.	0
2/10/1998	2133	50 kts.	0
6/21/1998	1730	0 kts.	1K
1/2/1999	730	0 kts.	1K

Date	Time	Winds	Property Damage
7/14/2000	1630	0 kts.	1K
7/22/2000	1930	0 kts.	10K
8/20/2000	1902	59 kts.	0
8/20/2000	1940	0 kts.	5K
8/31/2000	1728	53 kts.	0
9/1/2000	2000	0 kts.	1K
9/1/2000	2006	0 kts.	5K
11/6/2000	1345	0 kts.	50K
6/5/2001	1445	0 kts.	15K
6/19/2001	1028	51 kts.	0
4/8/2002	1315	0 kts.	15K
4/8/2002	1334	57 kts.	0
4/8/2002	1355	0 kts.	10K
7/7/2002	1805	0 kts.	4K
7/13/2002	1238	56 kts.	0
7/13/2002	1250	0 kts.	0K
7/17/2003	1420	50 kts.	3K
11/18/2003	945	50 kts.	8K
4/11/2004	420	52 kts.	0
6/3/2004	1422	53 kts.	0
7/6/2004	1300	50 kts.	15K
11/24/2004	500	50 kts.	2K
1/13/2005	910	50 kts.	2K
7/3/2005	1500	50 kts.	2K
8/15/2006	1615	50 kts.	0K
11/6/2006	1718	50 kts.	1K
5/4/2007	1205	50 kts.	1K
2/6/2008	338	63 kts.	0K
2/12/2008	1442	59 kts.	0K
2/12/2008	1445	50 kts.	2K
5/15/2008	800	50 kts.	2K
3/27/2009	1200	50 kts.	1K
4/2/2009	1233	50 kts.	4K
5/16/2009	1330	50 kts.	3K
7/2/2009	1826	52 kts.	0K
6/4/2010	1300	52 kts.	2K
11/30/2010	710	61 kts.	50K
4/4/2011	1844	51 kts.	0K
			1.265M