Pre-Disaster Mitigation Plan for Montana State University - Billings

FINAL
November 2007

TETRA TECH

Prepared for
The Montana Office of the Commissioner of Higher Education
and
The Montana University System
and
Montana State University - Billings
and
Montana State University Extension Disaster Education Network

EXECUTIVE SUMMARY

During the late 1990's, in partnership with six major universities, the Federal Emergency Management Agency (FEMA) developed the Disaster Resistant University (DRU) Program. At that time, FEMA officials recognized the major role universities played in both the structure and stability of the local economy within which they operated, and postulated that the result of a hazard impact that forced one of these institutions to close would have a dramatic negative effect on the surrounding community. Universities are unique organizations that not only serve their communities and states, but also the local government which has invested significant economic and social capital in them.

Pre-Disaster Mitigation (PDM) Plans have been developed for eight campuses of the Montana University System to identify the hazards that each campus faces and assess the vulnerability to the potential event. Hazards, whether they are technological or natural, affect campuses with varying frequency sometimes causing death and injury, imposing monetary losses and disruption of the University's mission as an educational institution. Losses can be measured in loss of educational class time, faculty and student departures, decreases in research funding and increases in insurance premiums. Losses can be substantially reduced or eliminated through comprehensive pre-disaster planning and mitigation actions. This PDM plan is for Montana State University-Billings (MSU-Billings).

Top hazards with the potential to affect the MSU-Billings campus (in alphabetical order) include:

- Flooding
- Hazardous Material Incidents
- Structure Fire
- Terrorism, Civil Unrest and Violence
- Wind and Thunderstorms including Hail and Tornadoes
- Winter Storms and Extreme Cold

Other hazards profiled in this plan but deemed to be low risk and low probability, and not addressed by mitigation actions at this time include:

- Aircraft Accidents
- Communicable Disease
- Landslides
- Volcanic Ash

The PDM Advisory Committee identified goals, objectives and projects to mitigate the effects hazards would have on the MSU-Billings campus. Top priority mitigation projects are:

- Construct Safe Room for Main Telephone Hub on MSU-Billings campus.
- Obtain emergency generator and transmitter (emergency repeater site) for KEMC radio station.
- Identify priorities for emergency generators needed for campus critical facilities and obtain generators.
- Provide awareness training on emergency response/safety to the whole campus.
- Provide Community Emergency Response Team (CERT) training for campus Safety Committee.
- Provide education on risk reduction and safety to students in syllabus (or alternate formats) every year.
- Provide awareness training on evacuation procedures (including disability evacuation) and location of emergency shelters through both oral and written presentations.

- Develop protocol for digital imaging of administrative records (i.e. human resources, payroll, transcripts, financial).
- Establish backup for Banner system at alternate campus/server.

This PDM Plan will be adopted by the Chancellor of MSU-Billings, at which time MSU-Billings will be eligible for PDM grant funding for eligible mitigation projects through the State of Montana and FEMA. The campus PDM Plan will be updated every five years. The plan review will identify new mitigation projects and evaluate mitigation projects and existing programs at MSU-Billings.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ACRONYMNS

BBWA	Billings Bench Water Association
CERT	Community Emergency Response Team
CDC	Center for Disease Control
DES	Disaster and Emergency Services
DMA	Disaster Mitigation Act
DRU	Disaster Resistant University
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
GIS	Geographic Information System
HPAI	High-Pathogenicity Avian Influenza (Bird Flu)
HVAC	Heating Ventilation and Air Conditioning
IT	Information Technology
MSU	Montana State University
NFPA	National Fire Protection Association
NRC	National Response Center
NTSB	National Transportation Safety Board
NWS	National Weather Service
OSHA	Occupational Safety and Health Administration
PDM	Pre-Disaster Mitigation
SARS	Severe Acute Respiratory Syndrome
USGS	United States Geological Survey

1.0 INTRODUCTION

In the last decade, disasters have affected university and college campuses in the United States with high frequency, sometimes causing death and injury, but always imposing monetary losses and disruption of the institution's teaching, research, and public service. Depending on the degree of severity, natural, human-caused or technological disasters can result in loss of educational time for students and economic hardship for the university and community. Damage to campus 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, and increases in insurance premiums. The effects from natural, human caused and technological hazards directly impact the safety and well being of university faculty, staff and students. While most hazards cannot be eliminated, the effects and losses can be substantially reduced through comprehensive pre-disaster planning and mitigation actions. The Montana University System, working in conjunction with Montana Disaster and Emergency Services (DES) and Tetra Tech Inc., prepared this Pre-Disaster Mitigation (PDM) Plan to help guide and focus hazard mitigation actions.

This PDM Plan is for the main campus of Montana State University-Billings (MSU-Billings). The plan provides a list of mitigation projects that will assist MSU-Billings in reducing risk and preventing loss from future hazard events.

1.1 AUTHORITY AND PURPOSE

The Federal Emergency Management Agency's (FEMA) Disaster Resistant University (DRU) initiative under the Disaster Mitigation Act (DMA) of 2000 provides for universities to be eligible for funding from federal assistance programs for hazard mitigation projects. The DRU Program's primary objective is to encourage universities to implement mitigation through actions that focus on safeguarding their research capacity as well as the human capital associated with their academic environment.

The purpose of this PDM Plan is to promote sound university policy designed to protect students, faculty, staff, citizens, critical facilities, infrastructure, intellectual property and the environment from natural and technological hazards. Upon final review and acceptance by the MSU-Billings PDM Advisory Committee, this PDM Plan will be adopted by the Chancellor of MSU-Billings and the campus will be eligible to compete for PDM grant funds through the State of Montana and FEMA. ***Appendix A*** contains a copy of the letter of adoption for the MSU-Billings PDM Plan.

1.2 ACKNOWLEDGEMENTS

Many groups and individuals contributed to development of the MSU-Billings PDM Plan. The Montana State Hazard Mitigation Officer, Montana University System Disaster Mitigation Coordinator, the Yellowstone County DES Coordinator, and the MSU-Billings PDM Advisory Committee provided support for all aspects of plan development. Faculty, staff, and students participated in the planning process by completing surveys and attending public meetings and contributed to plan development by reviewing and commenting on the draft plan.

1.3 SCOPE AND PLAN ORGANIZATION

The process followed to prepare the MSU-Billings PDM Plan included the following:

- Identify and prioritize disaster events that are most probable and destructive,
- Identify critical facilities,

- Identify areas within the community that are most vulnerable,
- Develop goals and objectives for reducing the effects of a disaster event,
- Develop specific projects to be implemented for each goal,
- Develop procedures for monitoring progress and updating the plan, and
- Adopt the plan.

The plan is organized into sections that describe the Campus Profile (Section 2), the Planning Process (Section 3), Risk Assessment (Section 4), Mitigation Strategies (Section 5), and Plan Maintenance Procedures (Section 6). Appendices containing supporting information are included at the end of the plan.

2.0 CAMPUS PROFILE

Universities are small communities within communities. Effective hazard mitigation must take into account the programs offered, research activities, size, location, the distribution of the campus community and its dynamic population composed of students, faculty, staff and a variety of visitors. Visitors and students, especially freshman, are often unfamiliar with the community and the potential hazards that can occur. The dynamic and diverse population on campus and the functions of the campus present a unique challenge in hazard mitigation and awareness.

2.1 CAMPUS OVERVIEW

The main MSU-Billings campus is located within the city limits of Billings, Montana in Yellowstone County (***Figure 2-1***). MSU-Billings has 16 buildings on a 112 acre campus (***Figure 2-2***) and is the third largest unit in the Montana University System. MSU-Billings offers a wide range of academic programs including licenses and certificates, associate, bachelor's and master's degrees. Other academic programs, unique in the Montana University System, are offered in the areas of Human Services, Special Education, Rehabilitation and a master's degree in Information Processing and Communication. Public service activities of the University include the Montana Center on Disabilities, established in 1947, and KEMC/KBMC Public Radio, which was originally licensed to the University in the early 1970s.

MSU-Billings is headed by a Chancellor and Administrative Vice Chancellor. The Faculty Senate provides representation for the faculty. The Associated Students of MSU-Billings provide the student government.

2.2 CAMPUS POPULATIONS

MSU-Billings has an average enrollment of more than 4,600 students, including approximately 400 graduate students. Students come from every area of Montana, in addition to more than 25 other states and 12 foreign countries. Out-of-state students are often unfamiliar with the community and the possible hazards that can occur.

The faculty consists of 425 fulltime staff including 150 full-time instructors. Each academic department is headed by a dean. Administrative officers head up non-academic departments on campus. Faculty consists of academic instructors and professors. Non-academic positions consist of staff.

Fall semester generally begins the first week in September and ends the third week in December. Spring semester generally begins the third week in January and ends the second week in May. Summer session generally begins during the early-May and ends late-August. Summer session is divided into three five-week sessions.

Populations on campus are dynamic. Occupancy in buildings and residence halls varies based on the time of day and day of the week, and from semester to semester. Most students are on the campus between the hours of 8:00 am and 5:00 pm. Daytime populations are spread out among all buildings. Large lecture halls are located in the Library in rooms 231, 148 and 152 and the College of Education Building room 427. Night classes are held between 5:00 pm and 10:00 pm and have lower attendance than day classes. Approximately 50 handicapped or disabled students attended MSU-Billings during 2006/2007.

Faculty and staff are dispersed in various buildings around campus and generally have offices within their own departments. Administration staff is generally located in McMullen Hall.

Figure 2-1

Figure 2-2

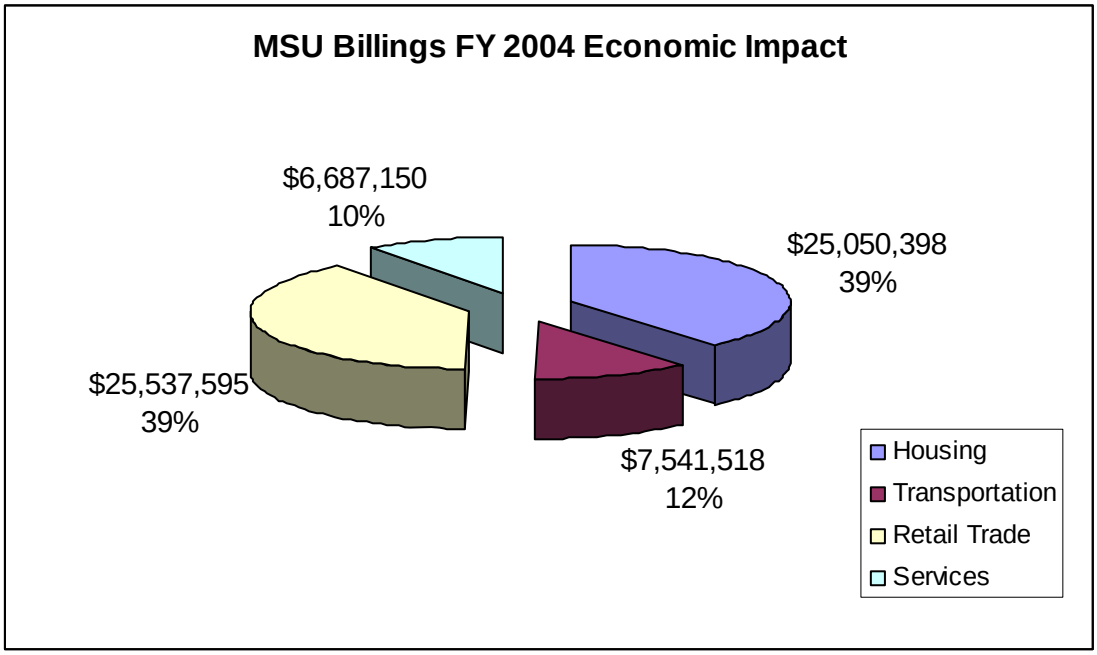
Visitors come to tour the campus, visit students, and attend various cultural and athletic activities. Athletic events such as football and basketball games often have a high attendance of students and visitors. Athletic and special events on campus are covered in detail in ***Plan Section 4.4.4.***

The majority (86 percent) of MSU-Billings' population resides off campus in non-university housing. MSU-Billings provides on campus housing for approximately 800 students. On campus residents halls are Petro and Rimrock Halls. Petro Hall is an eight-story 500-room residence hall with an average residency of 480 students each semester. Rimrock Hall is designed to house 300 student residents.

2.3 CAMPUS ECONOMY

The Montana University System plays a vital roll for Montana's Economy because of the direct spending by the institution's faculty staff and students and the attraction of dollars to the state. The Montana University system invests $150,000,000 annually and accounts for half-a-billion dollars in the Montana economy. MSU-Billings is an important contributor to the economy of Yellowstone County. The community and the university are mutually dependent on each other economically. Numerous local businesses serve the university and local merchants depend upon business from staff and students. The loss of MSU-Billings' ability to function or provide services would have a significant impact on Billings and the surrounding region. Immediate impacts from university closure would be the loss of jobs and local sales. Long term losses would include loss of tuition and research dollars and loss of the university's contribution of professional workers to the regional economy.

MSU-Billings' total economic contribution to the state economy in 2004 was estimated at $65,441,448. ***Figure 2-3*** shows MSU-Billings' contribution to the state economy by sector.



http://www.montanainvests.org/

Figure 2-3 MSU-Billings' Contribution to the State Economy

3.0 PLANNING PROCESS

The PDM Plan for MSU-Billings is the result of a collaborative effort between university faculty, staff, students, citizens, public agencies and regional, state, and federal organizations. Public participation played a key role in development of campus goals and mitigation projects. The planning process was facilitated by the contractor, Tetra Tech.

3.1 PDM ADVISORY COMMITTEE

An advisory committee was developed at the initiation of the project. The MSU-Billings PDM Advisory Committee consisted of campus staff involved in administration, health and safety, facility maintenance, information technologies and risk management. Members of the PDM Advisory Committee are shown in ***Table 3-1***.

TABLE 3-1
MSU-BILLINGS PDM ADVISORY COMMITTEE

Name	Position
Eakle Barfield, chair	Facilities Services Director
Joe Arrendondo	Campus Police
Ken Billman	Maintenance Supervisor, Facilities Services
Susan Dickson	Admin. Services-Insurance/Risk Management
Barb Hagel	Chief, Campus Police
Terrie Iverson	Administrative Vice Chancellor
Curt Kochner	Vice Chancellor of Student Affairs
Jim Kraft	Yellowstone County DES Coordinator
Jeannie McIsaac	Director, Student Life and Housing
Ken Murphy	Campus Police
Marylou Ross	Student Health Services
Patty Rukstad	College of Professional Studies, Downtown Campus
Ron Sexton	Chancellor
Liz Tooley	Director College of Technology
Shelley Van Atta	Director, University Relations and Media
Dr. George White	Provost

Members of the PDM Advisory Committee attended meetings, identified hazards and concerns, identified mitigation actions and reviewed and revised the plan. The PDM Advisory Committee reviewed a variety of information during the planning and review process including campus maps, documents, and meeting notifications and mitigation strategy documents.

3.2 STAKEHOLDER PARTICIPANTS

The PDM planning process was initiated by preparing a contact list of individuals whose input was needed to help develop the plan. On the campus level, participants included various faculty, staff, and students interested in the project. On the City-County level, these persons included the Yellowstone County DES Coordinator, local police department, fire department, public works department, health department, and the Local Emergency Planning Committee. The utility involved in the planning process was Northwestern Energy. Personnel from the Red Cross were also invited to participate in the planning effort.

Persons and entities on the stakeholders contact list received a variety of information during the planning process, including project maps and documents for review, meeting notifications, and mitigation strategy documents. ***Appendix B*** contains the PDM Stakeholders contact list.

3.3 REVIEW OF EXISTING PLANS AND STUDIES

At the initiation of the project, all planning documents, studies, reports and technical information available for the campus were reviewed and incorporated into the PDM document, as appropriate. These plans and existing studies included:

- Yellowstone County Pre-Disaster Mitigation Plan (***Appendix E***)
- MSU-Billings Emergency Response Plan

3.4 HAZARD PROFILE SURVEY

An internet-based Hazard Profile Survey was developed at the beginning of the planning effort to solicit input from university students, faculty and staff. Designed as a tool to aid in profiling hazards for the plan, the survey included sections on natural hazards, biological hazards, geologic hazards, human caused hazards, hydrologic hazards, and technological hazards. Twenty six hazards were considered in two sections on the survey. One section asked whether the hazard occurred in the planning area and its frequency. The other section asked whether respondents were concerned with the hazard and the degree of their concern. Follow up questions included whether or not critical facilities, critical infrastructure or vulnerable populations had been or could potentially be impacted by hazard events. Survey respondents were questioned on their knowledge of emergency preparedness, evacuation routes, shelters and whether or not the University provides any emergency readiness awareness. A section of the survey requested input on what should be done to mitigate the effects of hazards on the University.

The web-based survey was available online via the project website. E-mails requesting participation in the survey were sent to faculty, staff and students, during May and September 2006. One hundred ten (110) individuals completed the survey, including 86 faculty, 22 staff, 1 student, and 1 individual classified as "other". A copy of the Hazard Profile Survey and a summary of the results for MSU-Billings are in ***Appendix B***.

3.5 PUBLIC MEETINGS

A public meeting was held at MSU-Billings during the drafting stage of the plan on Thursday, July 27, 2006, at the Student Union. The purpose of the meetings was to gather information on historic disasters, campus vulnerabilities and to gather ideas about mitigation planning and priorities for mitigation goals. Sign-in sheets from the public meeting and a meeting summary are in ***Appendix B***.

In advance of the public meeting, a press release was distributed to university, local and regional newspapers including the Billings Gazette, the local Billings newspaper. Additionally, notices were sent to all campus entities and local officials on the stakeholder list. A copy of the press release is in ***Appendix B***.

The public meeting gave the campus community the opportunity to comment on the plan during the drafting stage. It also provided an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process.

3.6 PROJECT WEBSITE

A project website was developed as a way to disseminate information on the project. Included on the website were meeting notes, Advisory Committee and Stakeholder contact lists, the Hazard Profiling Survey, survey results, and draft mitigation strategies. Draft versions of the campus PDM Plan were placed on the project website so stakeholders could download the document for review purposes. Reference materials such as relevant FEMA documents and county disaster plans were also available on the project website.

3.7 REVIEW PROCESS

Hard copies of the draft plan document and electronic copies of the plan on compact disk were provided to the PDM Advisory Committee chairperson for distribution. The draft plan was also available on the project website. Individuals on the PDM Advisory Committee and Stakeholders lists were notified that the draft PDM Plan was available for review and a press release was submitted to the local newspaper notifying the public on how to obtain a copy of the plan and how to comment. The draft PDM Plan was available for review for 30 days.

Comments received on the draft plan were submitted to the chairperson of the PDM Advisory Committee who reconciled any contradictory comments and provided the contractor with a consolidated list of comments to incorporate in a final draft version of the plan. The final draft plan was submitted to the State Hazard Mitigation Officer and FEMA for review. Their comments were addressed in a final plan that was then submitted to the Chancellor of MSU-Billings for adoption.

Future comments on this plan should be addressed to the PDM Advisory Committee chairperson, as follows:

Facilities Services Director
Montana State University-Billings
1500 University Drive
Billings, MT 59101
406-657-2309

4.0 RISK ASSESSMENT

A risk assessment was conducted to address requirements of DMA 2000 for evaluating the risk to the campus from the highest priority hazards. DMA 2000 requires measuring potential losses to critical facilities and property resulting from natural hazards by assessing the vulnerability of buildings and critical infrastructure to natural hazards. In addition to the requirements of DMA 2000, the risk assessment approach taken in this study will evaluate risks to vulnerable populations and also examine the risk of technological hazards. The goal of the risk assessment process is to determine which hazards present the greatest risk and what areas are cumulatively the most vulnerable to hazards.

The risk assessment approach used for the PDM Plan entailed evaluation of building structural characteristics, building values, content values, and building functions and services. Where applicable, Geographic Information System (GIS) software and data were used to evaluate campus vulnerabilities. This type of approach to risk assessment is very dependent on the detail and accuracy of the data used during the analysis. Some types of hazards are extremely difficult to model. The schedule and resources available for conducting this risk assessment dictated that existing data be used to perform the assessment. The existing information available is extensive but also has many limitations.

The risk assessment is broken down into several sections which describe campus and community critical facilities and services, campus buildings, and the academic and social values necessary to maintain the functionality and educational environment of the campus. The final sections include the hazard profile and vulnerability assessment of the MSU-Billings campus.

4.1 CRITICAL AND VULNERABLE RESOURCES AND VALUES

Resources for the campus include assets such as facilities and infrastructure necessary for the university to conduct operations and provide services. Resources can be housed on campus or in the community. Values include academic, historical and cultural assets.

4.1.1 Campus Buildings

The main buildings on the MSU-Billings 122 acre campus consist of nine classroom buildings, two residence halls, a tennis bubble, physical plant, parking garage, and a physical education building.

Buildings are an important asset to the campus. Their vulnerability depends upon characteristics such as size, age, building materials and construction quality. Other vulnerability factors include building value, historic value, building contents, occupancy, and whether or not hazardous materials are stored in them. Building characteristic information was compiled from the State of Montana Commercial Property Schedule and Property Appraisals from the Montana Department of Administration Risk and Tort Management and Defense Division, and was verified by campus personnel. A FEMA Tier 1 building assessment, assessing earthquake vulnerability, has not been completed for the buildings at MSU-Billings. ***Appendix C*** contains photos of most campus buildings with detailed characteristics and insurance details.

Combining the type of structure and the year it was designed yields a risk variable known as the design level. The level is noted as low, medium or high and it relates directly to the specific building code used during the design process. In Montana, the Uniform Building Code (UBC) governed structural building practices after 1941 until the adoption of the International Building Code in 2002. This assessment employs the UBC code benchmarks in determining design level. Structures designed to the most current code are in the high category while structures designed before 1941 fall into the low category.

Buildings designed after 1941, but before the adoption of the most recent code, land in the medium group.

4.1.2 Building Characteristics

Building age, quality of construction, size and construction materials are indicators of how well a building can withstand a disaster. ***Table 4-1*** and ***Figure 4-1*** shows construction material and building age for the MSU-Billings campus.

Buildings constructed of concrete or reinforced steel have a better chance of withstanding a disaster than those constructed of unreinforced masonry or wood. Buildings constructed with unreinforced masonry are at greatest risk to damages from earthquakes and those constructed from wood frame construction are at greatest risk to fire. Buildings constructed from unreinforced masonry or wood are at a greater risk to damage during an explosion compared to those constructed of concrete or reinforced steel.

Hazardous materials stored in buildings present a risk to the building, its contents, and the building occupants. Hazardous material risk was ranked as low, medium, and high by campus personnel based on the volume and type of materials stored:

- Low indicates no or very few chemicals such as cleaning supplies,
- Medium indicates moderate amount of chemicals such as maintenance chemicals or a photo lab or other art studio, and
- High indicates very toxic chemicals usually found in science laboratories or central power stations.

Table 4-1 identifies which buildings house hazardous materials on the MSU-Billings campus and ***Figure 2-2*** shows the location of these buildings.

All campus buildings have fire alarm systems and evacuation maps showing a primary and secondary exit routes. The campus Safety Committee maintains evacuation maps and posts them in each building. Some of the maps are available online to staff. Drills are conducted each semester. Students are instructed to follow or meet with their faculty member for accountability purposes.

4.1.3 Community Critical Facilities and Services

Critical facilities in the community are defined as those that provide, or are used to provide essential products and services that are necessary to preserve the welfare and quality of life and fulfill important public safety, emergency response, and/or disaster recovery functions. Community critical facilities considered in this report are those that provide services the campus cannot provide during an emergency event.

City of Billings Fire Department

MSU-Billings is dependent on the City of Billings Fire Department for Emergency Services. Billings has six fire stations within its city limits. The closest fire station is 1.27 miles from the MSU-Billings campus.

TABLE 4-1
MSU - BILLINGS BUILDING CHARACTERISTICS

No.	Name	Fire Sprinklers (yes/no)	Backup Power (yes/no)	Haz Mat Risk (LMH)	Occupancy (Students/Residents)	Year Built	Square Feet	Building Value	Content Value	Construction Class	Historical Building
2	Tennis Bubble	N	Y	L	10	2001	unknown	unknown	unknown	unknown	N
3	Child Care Center	Y	N	L	35	1971	unknown	unknown	unknown	unknown	N
4	Guest House	N	N	L	2	1984	unknown	unknown	unknown	unknown	N
8	College of Business - McDonald Hall	N	N	L	1,407	1970	36,548	unknown	$1,436,760	U	N
20	Physical Plant	N	N	M	24	1979	16,705	$1,411,700	$469,040	B	N
22	College of Education and Human Services Building	Y	N	L	1,477	1972	96,340	$21,565,232	$5,359,848	C	N
25	KEMC Radio Station	N	N	L	3	1970	3,489	$269,048	$416,000	D	N
30	Rental House Group, All	N	N	L	120	various	unknown	$139,713,936	$40,038,313	D	N
31	Townhomes (family housing) 32 Mountain View	N	N	L	30	2003	unknown	$1,352,000	unknown	D	N
39	Parking Garage & Sky Bridge	Y	N	L	6	2000	183,000	$5,730,712	$93,600	B	N
43	Rental House-Foundation - 2615 Virginia Ln	N	N	L	12	1982	2,958	$251,058	$100,657	D	N
45	Poly Building	N	N	L	20	1988	4,263	$341,381	$94,479	D	N
46	Chancellor's Residence - 432 Silver	N	N	L	3	1968	4,372	$159,141	unknown	D	N
47	Library Classroom Building	N	Y	L	799	1968	84,200	$11,039,392	$4,643,600	C	N
48	Liberal Arts Building	Y	Y	L	3,831	1970	96,378	$14,190,488	$3,788,824	A	N
53	Physical Ed Building	Y	Y	L	609	1961	112,997	$12,610,312	$888,160	B	N
54	Apsaruke Hall	N	N	L	67	1957	20,185	$2,524,600	$793,520	B	N
55	Academic Support Center	N	N	L	557	1955	12,968	$1,336,294	$1,310,920	C	N
57	Cisel Hall	N	N	L	325	1951	40,621	$6,058,000	$1,326,000	C	N
58	Science Hall	Y	Y	H	1,138	1947	48,080	$6,915,480	$3,771,995	C	N
59	Art Annex	N	N	M	72	1980	6,705	$722,592	$263,536	C	N

TABLE 4-1
MSU - BILLINGS BUILDING CHARACTERISTICS

No.	Name	Fire Sprinklers (yes/no)	Backup Power (yes/no)	Haz Mat Risk (LMH)	Occupancy (Students/Residents)	Year Built	Square Feet	Building Value	Content Value	Construction Class	Historical Building
60	McMullen Hall	N	Y	L	135	1935	55,025	$7,207,096	$3,835,640	B	N
70	Petro/Rimrock/SUB Complex	Y	N	L	480	1962	280,676	$31,593,848	$6,142,032	B	N

Notes:

Building Construction Class: A - Fire-Protected Steel Frame, B - Reinforced Concrete Frame, C - Unprotected Steel Frame With Non-Combustible (Masonry) Exterior, D - Wood Frame, E - Steel Frame With Combustible Exterior Walls, F - Steel Stud, G - Pre-cast Frame, H - Unreinforced Concrete Frame, U - Unknown

Hazardous Materials: Low (L) - no or very few chemicals such as cleaning supplies,
Medium (M) - moderate amount of chemicals such as maintenance chemicals or a photo lab or art studio,
High (H) - very toxic chemicals usually found in science laboratories or central power stations.

Building Value - based on values reported by the university to the State of Montana Risk and Tort Management Division. The division puts a four percent increase on the value to ensure it is insured at market value. ***Figure 4-2*** shows Building Values

Content Value - based on values reported by the university to the state of Montana Risk and Tort Management Division. Building content values includes all of the physical property in the building. Economical damages associated with building content include but are not limited to books, technical instruments, research equipment, art, specimens, and furniture. ***Figure 4-2*** shows Content Values.

City of Billings Police Department

MSU-Billings relies on the services of the Billings Police Department for services above and beyond what the campus police can offer. The closest police station is 1.4 miles from the MSU-Billings campus.

Hospitals and Urgent Care

St. Vincent Healthcare is located at 1233 N. 30th Street, approximately 0.3 miles from the MSU-Billings campus. St. Vincent's offers a full service hospital and emergency room and Level II trauma service.

Deaconess Billings Clinic is located at 2800 10th Ave N., approximately 0.7 miles from the MSU-Billings campus. The clinic does not have an emergency department.

4.2 CAMPUS CRITICAL INFRASTRUCTURE

Campus infrastructure includes systems that are essential for campus activities, administrative operations, maintaining many types of campus experiments, and the ability of the campus to communicate. Determining the location, condition and vulnerability of utilities and communications systems necessary for the campus to function is an important step in mitigation of potential damages and overall risk from hazards.

4.2.1 Electricity and Natural Gas

Electricity and natural gas is provided by Northwestern Energy. The MSU-Billings campus does not have a central heating plant and each building relies on its own heating system. Electrical lines on campus are all buried. However, the main electric distribution lines feeding the campus are above ground and have been interrupted during severe weather events. In 2005, a squirrel caused the main transformer feeding the campus to burn out which resulted in a campus wide power failure. MSU-Billings maintains seven to ten days worth of back-up propane in the event the gas supply is interrupted. Several buildings on campus have back-up power. ***Table 4-1*** lists the buildings with backup power.

Natural gas lines run to every building on campus. There is a master shut-off valve that can shut off gas service to the campus.

4.2.2 Information Systems, Telephone, Communications and Internet

The Banner System is a centralized, administrative data management system based at Montana State University in Bozeman (MSU-Bozeman). This commercially developed computer application is used to administer campus operations for the entire Montana University System. MSU-Bozeman maintains backups for the Banner System.

Information Technology maintains the centralized campus computer network which provides high speed interactive computer access to libraries, science and technology databases, software resources, government records, bulletin boards and archival searching systems. The information technology department is located on the 3rd floor of McMullen Hall. Data lines on campus are buried. The centralized computer systems will be a redundant system by the end of 2007. All faculty and staff store their information on central storage servers which are backed up nightly and weekly.

The Information Commons (previously in the Computer Annex) is located on the first floor of the MSU-Billings Library. All computers in the Information Commons are connected to a network (LAN)

providing students at each computer access to the Internet, e-mail, disk storage, and the Library's Public Access Catalog as well as other online Library resources. The server can be accessed from any computer connected to the campus network. People who use a screen reader can only access Library resources if a computer has a screen reader.

Each residence hall (Rimrock and Petrol) offers a computer lab with approximately 15 computers available 24 hours a day to on-campus students. Internet access is provided in each residence hall room. There are also computer labs in the Library, College of Education, Academic Support Center, and McDonald Hall. Computers with screen readers are not located in all computer labs.

There is a telephone hub on the MSU-Billings Campus that provides internet service to the City of Billings, Yellowstone County and the entire Montana University System. The phone hub is located in the Rimrock Building. The phone hub is located in a room that has been flooded on numerous occasions. There is no redundancy in the telephone systems. The campus telephone system is completed dependent upon the Information Technology Systems. There is currently a plan being developed to use cell phones through the state network as part of a back up system in the event the phones are unavailable.

4.2.3 Water and Sewer

The City of Billings Public Works Department provides both water and sewer services to the MSU-Billings campus and other off-site facilities. The water source for the Billings municipal water system is the Yellowstone River. The City's distribution system has 11 pressure zones and requires all treated water to be pumped from the City's water treatment plant. The campus is in pressure zone 3 which has a reservoir storage capacity of 5.5 million gallons. The campus water system is configured with two separate systems, one being primarily domestic and the other primarily for fire protection. Both these systems, at a minimum, have two separate water meter services. The multiple feeds minimize the potential for disruption of domestic and fire protection to the entire campus. The water system downstream of the water meters is private and is maintained by the university.

4.3 CAMPUS CRITICAL FACILITIES AND SERVICES

Campus critical facilities and services are defined as facilities and services that are essential or critical to campus operations on a daily basis and after an emergency. Examples include shelters, medical care facilities, emergency services (police, fire ambulance), information storage, communications, and utilities.

4.3.1 Administrative Services and Campus Records

Administrative services on the MSU-Billings campus are located primarily in McMullen Hall. Services on the 1st floor included admissions and records, registrar and financial aid. Services on the 2nd floor include offices of the Chancellor, Provost and Academic Vice Chancellor, Vice Chancellor for Student Affairs, the Administrative Vice Chancellor, Office of Graduate Studies & Research, University Relations, Grants Development, Budget Office, Institutional Planning, and Academic Senate. Services on the 3rd floor include Human Resources, Financial Services, and Information Technology. Services in the basement include the mailroom, printing services and the business services.

In the event McMullen Hall was unusable because of a disaster, some administrative services would be picked up through MSU-Bozeman.

4.3.2 Risk Management and Safety

The campus Police Chief acts as the campus Safety Officer and is responsible for ensuring safety of students, employees and property on campus by developing and maintaining safety manuals and emergency action plans. The campus Safety Officer is responsible for hazardous materials laboratory safety manuals, hazardous material plans, and bio-hazard plans.

The campus Safety Officer coordinates emergency personnel on campus and is responsible for training campus personnel in emergency response. The office is also responsible for public outreach regarding campus safety.

4.3.3 Student Health Services

The MSU-Billings Student Health Services is located on the second floor of Petro Hall. The Student Health Service is staffed by doctors, mid-level practitioners, and registered nurses. All health care matters and emergencies beyond what Student Health Services can manage are provided by St. Vincent's Healthcare or Deaconess Billings Clinic, as described in ***Section 4.1.3***.

4.3.4 Campus Police/Security/Emergency Services

The MSU-Billings Campus Police Department provides emergency services to students. The Campus Police Department has trained, certified, and sworn police officers on duty to patrol and to respond to calls 24 hours a day, seven days a week. All officers have powers of arrest, have graduated from the Montana Law Enforcement Academy and have received basic to advanced certification from the Montana Peace Officers Standards and Training Council. Campus police officers patrol the campus by patrol car and on foot. Campus police personnel work with local, state, and federal police agencies and have direct radio communication with the Billings Police Department. Major offenses are reported to the Billings Police Department and cooperative investigations are initiated by both agencies.

4.3.5 Shelters and Residence Halls

The Red Cross has designated the Physical Education Building on the MSU-Billings campus as an emergency shelter for the MSU-Billings campus as well as the Billings community. There are no formal agreements for off-campus sheltering of the MSU-Billings population.

Rimrock Hall and Petro Hall are the on campus residence halls. Rimrock Hall, completed in 1962, is designed to house 300 student residents. The building provides direct access to dining facilities and the Student Union. Petro Hall, completed in 1965, is an eight-story 500-room residence hall providing housing for an average of 480 students each semester. The first floor of Petro Hall features a theater, lounge areas and the university bookstore. The second floor contains living quarters for residence hall staff, a student lounge, and the Student Health Center. The remaining six floors are for student housing. Family Housing residents numbers vary from year to year but on average hold 30 residents.

4.3.6 Facilities Services

Facilities Services maintains the infrastructure of the campus and is critical to the continuity of functions and services. Facilities Services is responsible for the design, construction, maintenance and operation of all university buildings, grounds, and infrastructure systems on the campus. The scope of services include: custodial services, landscaping and grounds maintenance, waste management and recycling, snow removal, horticulture management and inventory, vehicle and equipment machine repair,

accounting, budgeting, computer system operation, warehousing, maintenance, construction management and campus planning. This also includes maintenance and rental responsibility for 43 off-campus rental units. These units and the College of Technology constitute a significant downtown presence.

In the case of a major disruption, Facilities Services would ensure that the infrastructure of the campus remained operational. During severe winter events, Facilities Services is in charge of snow removal on campus. In the case of a catastrophic event, Facilities Services would be responsible for the assessment and reestablishment of services as well as other important hazard mitigation activities. Facilities Services would be responsible for shutting down a building's environmental systems in the event of a chemical, biological, or nuclear weapons attack or accidental toxic release. Facilities Services is also responsible for helping departments secure shelving and other important hazard mitigation activities.

4.4 SOCIAL AND ACADEMIC ASSETS

Academic, historic and cultural resources housed on campus are considered priority assets. The following section describes these campus resources. ***Figure 4-2*** lists both building value and the value of building contents.

4.4.1 Historic Buildings

Preserving and maintaining historical buildings on campus preserves a part of the university's past, and adds to the atmosphere of the campus environment by preserving architecture. Buildings older than 50 years qualify for the National Historic Register. Building ages are listed in ***Table 4-1.*** The National Historic Register does not list any buildings on the MSU-Billings campus. Buildings over 50 years old at MSU-Billings that may be considered historic are:

- Academic Support Center (1955)
- Cisel Hall (1951)
- Science Hall (1947)
- McMullen Hall (1935)

The construction materials and techniques used during the late 19th and early 20th century cause historical buildings to be more at risk for structure fire.

4.4.2 Campus Research

Research is an integral part of the mission of MSU-Billings. Research is conducted in every academic building on campus and the possibility of research occurring in other buildings is high. With the exceptions of activities in the Science building and Alterowitz Gymnasium, the preponderance of research is in the social science. The Science building houses research project that could potentially involve hazardous materials.

The Department of Biological and Physical Sciences at MSU-Billings is housed in Science Hall. Science Hall has over 33,600 square feet of space to accommodate the science faculty and students. The building contains four dedicated lecture rooms including a large auditorium. There are a total of sixteen laboratory rooms in Science Hall that are used by faculty and students for coursework and research. In addition to the lecture rooms and laboratories, there are three instrumentation suites, one chemical and supply stockroom, one darkroom, and a departmental library. Science Hall also has a full greenhouse facility, an herbarium, and a cadaver laboratory.

Figure 4-2

The Department of Biological and Physical Sciences houses modern equipment for student use in coursework and research. The department has an array of computers for use in experimentation and in the presentation of information. The department is equipped with a variety of microscopes including dissecting, light, phase contrast, and fluorescent microscopes. The department has all the necessary equipment to perform recombinant DNA-based research and coursework as well as sterile tissue culture. Centrifuges include microcentrifuges, low speed models and an ultracentrifuge. The department is equipped with scintillation counters, visible, UV and IR spectrophotometers, and an NMR apparatus. Gas chromatography, high pressure liquid chromatography, and flame atomic absorption equipment is also available. Walk in refrigeration and freezer units are present, as is a variety of equipment for studies in physics and earth science.

4.4.3 Special Collections

Johnston Collection

Vanette Johnston donated her husband's research library on the America West to the Montana State University Billings, Library. Approximately 750 books on fur trade, American Indians (such as Nez Perce, Apache, Sioux), American Indian Wars, Custer, and general American western history comprise this collection. There are also pamphlets, various and incomplete collections of journals, his research notes, a signed manuscript, two prints– *The Parting of the Brigade* by Gary Carter (signed), and *The Last Crossing* by Richard Luce (signed). The collection has two bronzes by Frederic Remington: *A White Trapper* and *Mountain Man*. The collection is housed at the library.

Willard E. Fraser Collection

Willard E. Fraser mayoral papers (1963-1969 & 1971-1972) contain the alphabetized file folders, letters, political campaign information, proclamations, memos, and his correspondence. Mayoral papers of Howard Hultgren (1969-1971) and Thompson T. Rowe (1949-1953) are also contained in this collection. The collection is housed at the library.

The Indian Publications Collection

The MSU-Billings Library owns many of the Council for Indian Education, Blackfeet Heritage Program, and Indian Reading Series booklets.

The Dudley White Collection

The Dudley White Collection contains personal papers, ledgers from Bannack, Virginia City, and Helena, Montana, photographs, books, drawings, prints, and artifacts. The collected books have a focus on Western and Montana history, and they were donated in his mother's honor, as the Dora White Memorial Collection. A majority of these books have been processed and are searchable through the online library catalog. The photograph collection contains personal and collected photos. The collected photos contain photographs by David Barry, the National Archives, L.H. Jorud, and K.D. Swan. Prints by J.K. Ralston, Frederic Remington, and Charles Russell, newspaper clippings, a scrapbook, 44 postcards, a stereoscope and stereoscopic photographs, and lithographs by Bowen & Co., Ackerman, E. Weber & Co. Balt, D. Appleton & Co., and U.S.P.R.R. Exp. Surveys are all additional items in the collection. Works by Ernest T. Seton, Karl Bodmer, Thomas Moran, L.A. Huffman, L.H. Rheedy, Will James, and various framed photographs make up the framed and unframed art pieces. All items are located within the Special Collections room of the library.

Terry C. Johnston Book Collection

The Terry C. Johnston book collection contains books on the Apache, Cheyenne, Crow, Nez Perce, and Sioux Indians, Indian Wars, Custer, and an extensive collection on Fur Trade.

The MSU-Billings Library purchased a collection of Artists' Books in 2000. These three-dimensional works are housed in the Special Collections Vault at the library.

4.4.4 Athletics and Campus Events

Athletic and cultural events on campus draw attendance from the student population and the community. Visitors to campus are often unaware of potential hazards or what to do in the event of a disaster. High attendance at athletic events could lead to an increased risk of human loss in the event of a catastrophic event. MSU-Billings does not currently have a plan in place to inform visitors of potential hazards that might affect the campus.

MSU-Billings offers men's intercollegiate competition in basketball, cross country, golf, tennis, and soccer, and women's intercollegiate competition in basketball, cross country, golf, tennis, volleyball, soccer, and softball. An extensive intramural program and many indoor and outdoor recreational activities are also offered.

The Indoor Tennis Center houses a host of activities including the men's and women's tennis teams, adult men and women league play, juniors, lessons, individual court reservations, high school tennis practice, MSU-Billings intramurals and MSU-Billings physical education classes. The Indoor Tennis Center is open to the public for year-round play.

Cenex Stadium is used for intercollegiate competition in women's softball. The field is also used for intramural softball.

The Physical Education Building includes the 3,500-seat Alterowitz Gymnasium and is used for intercollegiate competition in men's basketball, and women's basketball and volleyball. The south balcony has space for indoor archery, golf, and baseball pitching and batting. The north balcony has a combatives area, handball courts, a swimming pool, dressing rooms for men and women with disabilities, men's and women's locker rooms, a training room, human performance lab used for physical fitness testing and studies, and a fitness center. The facility also includes an annex which has a large gymnasium divisible by curtains into two sections each with a high school-sized basketball court, two tennis courts, three volleyball courts, six badminton courts, four racquetball-handball courts, and a suspended running track.

The Student Union, located between Petro Hall and Rimrock Hall, is the hub of student activities. It provides space for Beezer's Bookstore, Business Operations (ID Cards, Vending), Campus Dining Services, Stingers Coffee Shop, ASMSUB, Housing and Residential Life, Office for Community Involvement, Recreational Activities, Multicultural Student Services, Petro Theater, The Retort (campus newspaper), student organization offices, and a student organization work/resource room.

4.5 UNIVERSITY HAZARD PROFILE

The hazard risk assessment requires information about what hazards have historically impacted the campus and what hazards may present risks in the future. Hazards considered during the planning

process included natural, biological, man-made, and technological. Identifying historical and possible future hazards was primarily accomplished in three phases.

The first phase involved reviewing the Yellowstone County PDM Plan (***Appendix E***). The Yellowstone County PDM Plan lists the following natural and manmade hazards as having the greatest risk of affecting the county:

Natural Hazards
1) Flooding
2) Wildfire
3) Wind and Hail Storms
4) Tornado
5) Winter Storms
6) Drought
7) Insect Infestations
8) Urban Fire
9) Dam Failure
10) Expansive Soil
11) Landslides
12) Earthquake
13) Volcanic Ash

Manmade Hazards
1) Transportation/Mobile Incident
2) Hazardous Materials Incident/Accident-Fixed
3) Terrorism/Bio-Terrorism
4) Civil Disturbance/Riot/Labor Unrest
5) Enemy Attack

The second phase of the hazard profiling process entailed meetings with the MSU-Billings PDM Advisory Committee, stakeholders, and the public for input on what hazards were applicable to the MSU-Billings campus. A web-based survey was conducted to obtain relevant input on hazard profiling. Results of the survey are in ***Appendix B*** and suggest that most of the regional hazards are also a concern to the MSU-Billings campus. A public meeting was held on campus and interviews were conducted with university staff and public officials during development of the plan to identify the top hazards affecting the MSU-Billings campus.

Hazards discussed and evaluated as having the potential to impact MSU-Billings are summarized in ***Table 4-2.***

TABLE 4-2
HAZARDS EVALUATED DURING PDM PLAN DEVELOPMENT

Natural Hazards	Human Caused Hazards	Technological Hazards
Thunderstorms & Lightning	Bomb Threats	Power Failure
Tornadoes	Terrorism	Energy Shortage
Windstorms	Aircraft Accidents	Nuclear Accidents
Hailstorms	Civil Disturbance	Nuclear Attacks
Severe Winter Storms	Structural Fires	Hazardous Material - Transportation (railway, roadway, waterway, airway)
Extreme Heat and Cold	**Geologic Hazards**	
Wildfire	Volcanic Activity	Hazardous Material - Fixed Sites (pipelines, underground storage tanks, etc).
Hydrologic Hazards	Earthquakes	
Floods	Landslides	**Biological Hazards**
Flashfloods	Expansive Soils	Communicable Diseases

The third phase of hazard profiling entailed researching government records and news publications for information on previous hazard events and what hazards could affect the campus in the future. The

results of the hazard evaluation were used to focus further risk assessment on hazards that historically had caused the most problems and those judged to be of most future concern.

The results of hazard profiling activities indicate that the following hazards should be the focus of the MSU-Billings risk assessment.

- Flooding
- Hazardous Material Incidents
- Structure Fire
- Terrorism, Civil Unrest and Violence
- Wind and Thunderstorms including Hail and Tornadoes
- Winter Storms and Extreme Cold

Other hazards profiled in this plan but deemed to be low risk and low probability, and not addressed by mitigation actions at this time include:

- Aircraft Accidents
- Communicable Disease
- Landslides
- Volcanic Ash

4.6 CAMPUS HAZARD AND VULNERABILITY ASSESSMENT

Campus hazards that were identified were evaluated to determine extent of risk to the campus. The methodology used in each hazard vulnerability evaluation is described under the description of each specific hazard. Hazard descriptions are listed alphabetically in this section.

Frequency for each hazard event was determined by considering the total number of events in the region, county or on campus and comparing it to the number of years of record. Accurate and consistent records have not been kept for many hazards so frequency was considered in general terms.

Probability of a hazard event occurring in the future was most often based on hazard frequency as determined by the number of times the hazard was likely to occur over a ten year period. Probability was broken down as follows:

- Common – greater than one event per year
- Frequent – less than 1 event per year but greater than one event every 10 years
- Infrequent – less than one event every 10 years

4.6.1 Aircraft Accidents

Aviation accidents can occur for a multitude of reasons from mechanical failure to poor weather conditions to intentional causes. Accidents can vary from small single engine aircraft to large commercial or military jets. The MSU-Billings campus is located 1.35 miles from the Billings Logan International Airport which serves eight passenger airlines and twelve cargo and mail carries and is the busiest airport in Montana. Total aircraft operations at the Local Airport for 2005 and 2006 were 103,881 and 102,838, respectively (Phoehn 2006). Emergency helicopters serving the trauma center at St. Vincent Healthcare, located approximately 0.3 miles from the MSU-Billings campus, also pose a potential threat to the campus.

According to the National Transportation Safety Board (NTSB), 22 percent of aircraft accidents occur during takeoff and the initial ascent which occurs within a few miles of the airport. Twenty-nine percent of aircraft accidents occur during initial approach and final approach which also occur within a few miles of the airport (NTSB 2006).

Location and Extent of Previous Events

During the years between 1982 and 2005, 225 aviation accidents and incidents were reported by the Federal Aviation Administration (FAA) in Billings (FAA 2006). The NTSB aviation accident database contains information from 1962 and later about civil aviation accidents and selected incidents within the United States. During the years 1962 to 2006, the NTSB reported 144 aviation accidents and incidents in Billings (NTSB 2006). No aircraft accidents to date have impacted the MSU-Billings campus.

Probability of Future Events

The proximately the airport and the large volume of aircraft activity over and near the campus creates a high risk of aircraft related incidents with the potential to impact MSU-Billings. However, the probability of this happening is considered infrequent (less than one event every 10 years).

Hazard Effects and Vulnerabilities

An aircraft related incident on campus would occur with little or no warning. The greatest threat an aircraft accident poses would be a direct impact to a structure which could result in fatalities or injuries and possibly a structure fire.

4.6.2 Communicable Disease

Communicable disease is a concern for campuses across the nation. With students coming from all over the country and internationally, the chances for disease spread increases. Communal living in residence halls also increases the risk of communicable disease. Residential and social circumstances within the college environment create a high risk environment for transmission or exposure if an outbreak were to occur. Communicable diseases of concern to college campuses include chickenpox, diphtheria, seasonal influenza, influenza strains, measles, mumps and rubella, bacterial meningitis, meningococcal disease, infectious mononucleosis, pertussis (whooping cough), severe acute respiratory syndrome (SARS) and tuberculosis.

The most serious communicable disease on U.S. campuses is meningococcal disease. Meningococcal disease is a potentially life threatening bacterial infection. The disease is most commonly expressed as either meningococcal meningitis, an inflammation of the membranes surrounding the brain and spinal cord, or meningococcemia, a presence of bacteria in the blood. It is estimated that 100 to 125 cases of meningococcal disease occur annually on college campuses and 5 to 15 students die as a result. The disease can result in permanent brain damage, hearing loss, learning disability, limb amputation, kidney failure or death. The U.S. Department of Public Health and Human Services Center for Disease Control (CDC) reports that freshman living in residence halls are the highest risk group and are six times more likely than any other risk group to contract meningococcal disease (CDC 1999).

SARS is a viral respiratory illness that was recognized as a global threat in March 2003, after first appearing in southern China in November 2002. The primary way SARS appears to spread is through close person-to-person contact. It is thought to be transmitted most readily by respiratory droplets produced when an infected person coughs or sneezes. The virus also can spread when a person

touches a surface or object contaminated with infectious droplets and then touches his or her mouth, nose, or eye(s). In addition, it is possible that SARS might be spread more broadly through the air or by other ways that are not now known. The illness usually begins with a high fever that is sometimes associated with chills or other symptoms, including headache, general feeling of discomfort and body aches. Some people also experience mild respiratory symptoms at the outset. Diarrhea is seen in approximately 10 to 20 percent of patients. After two to seven days, SARS patients may develop a dry, nonproductive cough that might be accompanied by or progress to a condition in which the oxygen levels in the blood are low (hypoxia). From November 2002 through July 2003, a total of 8,098 people worldwide became sick with SARS. Of these, 774 died. By late July 2003, no new cases were being reported, and the global outbreak was considered over. In the United States, only eight persons were laboratory-confirmed as SARS cases. There were no SARS-related deaths in the United States. All of the eight persons with laboratory-confirmed SARS had traveled to areas where SARS transmission was occurring (CDC 2005).

Exposure of poultry to migratory waterfowl and the international movement of poultry, poultry equipment, and people pose risks for introducing high-pathogenicity avian influenza (HPAI), commonly referred to as the Bird Flu, into U.S. poultry. Once introduced, the disease can be spread from bird to bird by direct contact. HPAI viruses can also be spread by manure, equipment, vehicles, egg flats, crates, and people whose clothing or shoes have come in contact with the virus. HPAI viruses can remain viable at moderate temperatures for long periods in the environment and can survive indefinitely in frozen material. One gram of contaminated manure can contain enough virus to infect 1 million birds. In some instances, strains of HPAI viruses can be infectious to people. Human infections with the avian influenza viruses under natural conditions have been documented since 1997. The H5N1 strain, identified in Hong Kong in 1997, was highly pathogenic for chickens and caused a limited outbreak in 18 people, six of whom died. In 2003, an H7N7 HPAI outbreak in the Netherlands resulted in human infections and one death. In mid-December 2003, a number of Asian countries reported additional outbreaks of H5N1 HPAI in chickens and ducks. As of May 2005, almost 100 cases of human infection had been reported in Vietnam, Cambodia, and Thailand, resulting in 53 fatalities (USDA APHIS 2005). According to the World Health Organization, of particular alarm is the HPA1 strain of most of these outbreaks–H5N1–which jumped the species barrier. It causes severe disease and may result in a high mortality rate in humans (USDA APHIS 2005).

An immunization policy is in effect and applicable for all new and returning students at MSU-Billings. For students born after December 31, 1956, proof of two separate doses of measles and rubella immunity by immunization record or a physician's record of diagnosis is required before students can register for courses. This policy is in effect at all units of the Montana University System.

Location and Extent of Previous Events

Communicable disease has not had a significant impact on the MSU-Billings campus in recent years. However, the Montana State Board of Health ordered the closing of public gathering places, including schools during the Spanish Flu outbreak in 1918. The Spanish flu killed 2,654 in Montana by the end of 1918. The pandemic was long-lived in Montana killing another 699 in 1919 (About the Spanish Flu, Helena Independent Record, January 29, 2006).

Probability of Future Events

Assessing the probability of future communicable disease outbreaks that significantly affect MSU-Billings is difficult due to the limited history of outbreaks and the rapid advancement in medical science during

the last 75 years. However, in 2005 the U.S. Health and Human Services Secretary, Michael Leavitt, warned that, "The likelihood of a human flu pandemic is very high."

Hazard Effects and Vulnerabilities

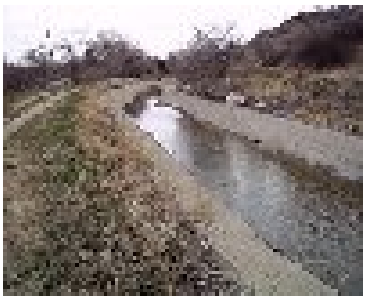
A major communicable disease outbreak on campus would have direct impacts to the health of students, staff, and faculty. The percentage of the campus population affected by an outbreak and the number of fatalities would be highly dependent on the disease itself and amount of advanced warning of a possible outbreak. The flu pandemic in 1918 was the most recent and deadly communicable disease outbreak in U.S. history. The worldwide death toll from this disease is estimated at between 50 million and 100 million. Normally, influenza causes the most deaths in the very old and the very young however this was not the case with the 1918 virus. In the United States, 99 percent of the deaths occurred in people younger than 65. The highest number of deaths was between ages 25 and 29. The virus affected between 25 percent and 30 percent of the population. The overall mortality rate was about 2.5 percent of those infected with pregnant women being hit the hardest. There were reports that among some populations, such as troops stationed in close quarters, the rate of mortality could have reached 20 percent of those infected. For the entire United States, the death toll is estimated at more than 600,000.

A major communicable disease outbreak could also disrupt the ability of the school to conduct classes. In the case of a severe outbreak event, the campus would shut down. This could result in a significant economic impact to the students, faculty, and staff and the region. MSU-Billings has a Pandemic Plan in place to respond to an outbreak of illness on campus.

4.6.3 Flooding

A flood is a natural event for rivers and streams. Excess water from snowmelt and rainfall accumulates and overflows the banks onto the adjacent floodplains. Floodplains are lowlands, adjacent to streams and lakes that are subject to recurring floods. Flooding also occurs when floodwater overflows canals and other waterways. A flash flood generally results from a torrential, short duration rain or cloudburst on a relatively small drainage area. Sheet flooding is where stormwater runoff forms a sheet of water and often occurs in areas where there are no clearly defined channels.

Hundreds of floods occur each year, making it one of the most common hazards in all 50 states. Floods kill an average of 150 people a year nationwide. Most injuries and deaths occur when people are swept away by flood currents and most property damage results from inundation by sediment-laden water. Faster moving floodwater can wash buildings off their foundations and sweep vehicles downstream. Pipelines, bridges, and other infrastructure can be damaged when high water combines with flood debris. Basement flooding can cause extensive damage.



The Billings-Bench Water Association (BBWA) canal flows along the south boundary of the campus. It is known to flood periodically, however, impacts from flooding typically affect the City of Billings and not the MSU-Billings campus.

Location and Extent of Previous Flood Events

July 20, 1997 – Runoff from a heavy rainstorm caused $12,870.13 in water damage to the campus (Montana Risk and Tort Management).

July 4, 2004 – Seven rentals flooded due to severe weather. Mold and water damages amounted to $2,171.59 (Montana Risk and Tort Management).

2005 – The BBWA Canal flooded impacting areas west of the MSU-Billings campus (public meeting).

Probability of Future Events

Due to the frequency of flooding on campus, the probability of future events is rated as frequent (less than one event per year but greater than one event every 10 years).

Hazard Effects and Vulnerabilities

Floodwaters on campus could damage buildings and inundate basements. Equipment and other contents located in basements are at the greatest risk to flood damage. Electronic equipment is at the greatest risk of flood damage. Campuses that have IT, phone systems, and records stored on higher floors are more adapt to have a faster recovery after a flood event. Floodwaters could damage classrooms and residence halls causing student displacement. Debris cleanup after a flood event could be costly and time consuming. Campuses with good stormwater retention/detention areas and storm sewer and surface water drainage systems are at a lesser risk from sheet flooding.

4.6.4 Hazardous Material Incidents

A hazardous material release is a human-caused hazard that can come from a fixed facility or transportation of material through the area. An accidental or intentional release of hazardous material could pose a health risk to those in the immediate area, downwind, and/or downstream. Hazardous materials at MSU-Billings are stored in many areas throughout the campus, as shown in ***Table 4-1***.

HVAC systems, if not properly shut down or controlled during a hazardous material event, have the potential to distribute hazardous material fumes throughout the building. Proper use of a building's HVAC system during both indoor and outdoor hazardous material releases can greatly reduce the impact of an event (Berkeley Lab 2004).

The MSU-Billings campus is located approximately one mile from the business route of Interstate-90 which is a hazardous material transportation route. According to the U.S. Department of Transportation *Emergency Response Guidebook* this is within the evacuation distance recommended for numerous hazardous materials. Several large industrial facilities are also located in Billings, within one mile of the MSU-Billings campus. A hazardous material release from one of these facilities would have he potential to impact the campus population.

Location and Extent of Previous Events

The U.S. Coast Guard's National Response Center (NRC) database indicates that 388 hazardous material events occurred between 1990 and 2006 in Billings. The Yellowstone County PDM Plan (***Appendix E)*** contains information from the NRC database. No hazardous material incidents have been reported at MSU-Billings.

Probability of Future Events

With 388 hazardous material events for Billings from 1990 to 2006, the probability of future events is rated as common (greater than one event per year).

Hazard Effects and Vulnerabilities

According to the U.S Department of Transportation there have been 136,409 hazardous material incidents on the nation's highways in the 10 year period ending in 2005. There have been 129 fatalities related to these events.

While hazardous material incidents do have the ability to cause damage to facilities and infrastructure if ignition of a flammable material occurs, the most likely effects are to human health and loss of services from affected facilities. According to the U.S. Department of Health and Human Services, hazardous material events have the following characteristics:

- Releases at facilities account for 70 to 75 percent, and transportation-associated releases account for 25 to 30 percent of reported events.
- Most releases occur on weekdays between 6 AM and 6 PM.
- Releases tend to increase in spring and summer when there are more shipments of pesticides and fertilizers.
- Equipment failure and human error cause most releases at facilities.
- Human error and equipment failure cause most releases during transport.
- More than 90 percent of events involve the release or threatened release of only one hazardous substance.
- Releases of hazardous substances most often injure employees, followed by the general public and-less frequently-first responders and school children.
- Respiratory irritation and eye irritation are the most commonly reported symptom or injury.
- Approximately 50 percent of people who reported developing symptoms or injuries from a hazardous material event are treated at a hospital and released.

The Emergency Response Plan for MSU-Billings is a structured manual that addresses the storage, handling and disposal of hazardous materials. A complete inventory of hazardous materials is maintained on campus. MSU-Billings has a Hazard Communication Plan to ensure compliance with the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard, 29 CFR 1910.1200.

4.6.5 Landslides

Landslides are the downward sliding of land masses. The rimrocks surrounding Billings have a high potential for landslides. Rockfalls occur where the cliffs are undermined by erosion. The sandstone blocks in the rimrocks can be as large as 20 feet across and are formed by a joint system that runs parallel to the cliff face. Cycles of freezing and thawing, and plant growth cause the joints to crack open and separate from the cliff face. Some joints along the Rims have opened to more than three feet. Precipitation increases the rate of separation. At some point, gravity takes over, and the stone blocks fall.

Location and Extent of Previous Events

The rimrocks surrounding Billings have experienced the highest occurrence of landslides in Yellowstone County (Yellowstone County PDM Plan 2004).

Probability of Future Events

According to the Yellowstone County PDM Plan, the risk of landslides is high because of the natural terrain in Yellowstone County. However, the probability of a landslide in the vicinity of the campus is considered infrequent (less than one event every 10 years).

Hazard Effects and Vulnerabilities

Landslide potential in the rimrocks is higher if slopes are undercut, watered heavily or receive higher than normal precipitation or experience increased weight from home-building or other developments. The proximately of MSU-Billings to the rimrocks put it at risk to landslides and falling rock. Roadways leading to the campus could become impassible if a landslide were to occur. The main power line feeding MSU-Billings runs along the top of the rims and is vulnerable to landslides.

4.6.6 Structure Fire

Structure fires have many causes including smoking, arson, industrial accidents, electrical malfunctions, laboratory accidents, and lightning. Fires also occur as a secondary effect of an earthquake when inflexible gas lines rupture. A large fire has the potential to cause high casualties and can result in secondary impacts such as hazardous material release and damaged utilities. Older buildings that were constructed without fire evacuation routes are at a higher risk for casualties.

Residence halls are at the highest risk for structural fire due to students living in close proximity and the residential activities that can cause fires. Residence hall fires are often ignited by faulty appliances, lamps, overloaded outlets, smoking, cooking or candles. Between 1994 and 1998, there was an average of 1,425 fires per year in college and university dorms, according to the National Fire Protection Association (NFPA). These fires result in an average of five deaths, 73 injuries and $29.4 million in direct property damage per year. The NPFA states that on average, direct property damage per fire is 41 percent lower in dormitory fires where sprinklers are present.

Location and Extent of Previous Events

November 4, 2000 – A kiln in the Art Annex overheated causing a roof fire. Damages were approximately $4,820 (Montana Risk and Tort Management Report)

Probability of Future Events

In 2002, the City of Billings Fire Department received 453 fire calls (Yellowstone County PDM Plan 2004). Due to the frequency of fires in the surrounding community in buildings of similar age and construction type as those on campus, the probability of future events is rated as frequent (less than than one event per year but greater than one event every 10 years).

Hazard Effects and Vulnerabilities

Existence of building sprinkler systems are the primary factor that determines the vulnerability from and overall impact of structural fires. Currently the Child Care Center, the College of Education and Human Services Building, Parking Garage and Sky Bridge, Liberal Art Building, Physical Education Building, Science Hall and the Petro Hall, Rimrock Hall, Student Union Building (SUB) Complex are the only buildings on campus with a sprinkler fire suppression system. Lack of sprinkler systems puts MSU-Billings at a high risk for structure fire.

All buildings on campus have fire and smoke detection alarm systems. Fire drills are routinely held.

4.6.7 Terrorism, Civil Unrest and Violence

Terrorism, civil unrest, and violence are human caused hazards that are intentional and often planned. Terrorism, both domestic and international, is a violent act done to try to influence government or the population regarding some political or social objective. Terrorist acts can come in many recognized forms or may be more subtle using nontraditional methods. Terrorists often use threats to create fear among the public, to convince citizens that their government is powerless to prevent terrorism, or to get immediate publicity for their causes. Terrorism events that could potentially affect the campus are cyber attacks, armed attacks (such as a single gunman), car bombs, or a chemical, biological, or nuclear attack.

High-risk targets for acts of terrorism include military and civilian government facilities, international airports, large cities, and high-profile landmarks. Terrorists might also target large public gatherings, water and food supplies, utilities, and corporate centers. Terrorists are capable of spreading fear by sending explosives or chemical and biological agents through the mail.

Cyber-terrorism on campus could involve destroying the machinery of the information infrastructure, remotely disrupting the information technology (IT) underlying the Internet, computer networks, or critical systems such as financial networks or mass media, or using computer networks to take over machines that control infrastructure functions. Sensitive student and employee information could be compromised in a cyber-terrorism event on campus. On a national level, if cyber-terrorists could disrupt financial markets or media broadcasts, an attack could undermine public confidence or create panic.

Civil unrest and violence typically occur when groups, organizations, or distraught individuals take action with potentially disastrous or disruptive results. Civil unrest can be the product of another event that creates panic in the community. Groups that advocate civil unrest that are known to be active in Montana according to the Southern Poverty Law Center (2006) include:

Neo-Confederate (League of the South - Big Fork, Montana) – Many groups celebrate traditional Southern culture and the Civil War's dramatic conflict between the Union and the Confederacy. But some groups go further to embrace racist attitudes towards blacks and, in some cases, to white separatism. Such groups are listed in this category. The League of the South, founded in 1994 and counting some 9,000 members by 2001 is at the center of the racist neo-Confederate movement. Calling for Southern secession, the League's leaders say minorities are destroying the "Anglo-Celtic" (white) culture of the South. They oppose most non-white immigration and all interracial marriages. Founder Michael Hill, a former college professor, has called blacks "a deadly and compliant underclass" and has embraced well-known white supremacists such as North Carolina attorney Kirk Lyons.

Neo-Nazi (Nation Alliance - Bozeman, Montana and National Socialist Movement - Butte, Montana) – Neo-Nazi groups share a hatred for Jews and a reverence for Adolf Hitler and Nazi Germany. While they also hate other minorities, homosexuals and even sometimes Christians, they perceive "the Jew" as their cardinal enemy, and trace social problems to a Jewish conspiracy that supposedly controls governments, financial institutions and the media. While some neo-Nazi groups emphasize simple hatred, others are more focused on the revolutionary creation of a fascist political state. The most significant neo-Nazi group in the U.S. is the National Alliance. Until his death, it was led by William Pierce, the author of the futuristic race-war novel *The Turner Diaries*, a book believed by some to have served as the blueprint for the 1995 Oklahoma City bombing.

Christian Identity (Church of True Israel - Noxon, Montana) – The Christian Identity religion asserts that whites, not Jews, are the true Israelites favored by God in the Bible. In most of its forms, Identity theology depicts Jews as biologically descended from Satan, while non-whites are seen as soulless "mud people" created with the other Biblical "beasts of the field." For decades, Christian Identity has been one of the most significant ideologies for the white supremacist movement. The most extreme Identity theology asserts that Christ will not return to earth until the globe is swept clean of Jews and other "Satanic" figures. In recent years, deep doctrinal disputes, the lack of a central church structure, and a shift among white supremacists towards agnosticism and racist variations of neo-Paganism have weakened the Identity movement and reduced the number of its members.

Violence can be small scale, such as domestic violence, or larger such as a school shooting/hostage situation that requires significant government response. Violence on college campuses is common. For the period 1995 to 2002, the U.S. Department of Justice indicates that college students ages 18 to 24 experienced violence at average annual rates lower than those for non-students in the same age group (61 per 1,000 students versus 75 per 1,000 non-students). Except for rape/sexual assault, average annual rates were lower for students than for non-students for each type of violent crime measured (robbery, aggravated assault, and simple assault). Rates of rape/sexual assault for the two groups did not differ statistically. Other findings from the Department of Justice (2005) comparing persons ages 18-24 include:

- Male college students were twice as likely to be victims of overall violence than female students (80 versus 43 per 1,000).

- White college students had some-what higher rates of violent victimization than blacks and higher rates than students of other races (65 versus 52 and 37 per 1,000, respectively).

- Female non-students were over 1.5 times more likely than college students to be a victim of a violent crime (71 versus 43 per 1,000). For males, students and non-students were equally likely to be the victim of a violent crime (about 80 per 1,000).

- White and black non-students had higher rates of violent victimization than college students (81 and 83 versus 65 and 52 per 1,000).

- Hispanic college students and non-students experience violence at similar rates.

Characteristics of violent victimizations of college students include:

- 58 percent were committed by strangers.
- 41 percent of offenders were perceived to be using alcohol or drugs.
- 93 percent of crimes occurred off campus, of which 72 percent occurred at night.

Location and Extent of Previous Events

Yellowstone County is at a very low risk of terrorism compared to other parts of the country. However, according the Yellowstone County PDM Plan, as the largest city in Montana, if an event were to occur in Montana the probability is high that an event would occur in Yellowstone County. To date there have been no incidents of terrorism or civil unrest at MSU-Billings.

Probability of Future Events

The probability of a terrorist act or civil disturbance at MSU-Billings is considered to be infrequent (less than one event every 10 years) due to the lack of previous events on the campus or in the region. The probability of campus violence is rated as frequent (less than one event per year but greater than one event every 10 years) due to the overall frequency of these events and their rising occurrence nationwide on college campuses.

Hazard Effects and Vulnerabilities

Terrorist attacks and civil disturbance have the potential to affect structures, infrastructure, and human life. Due to the lack of nationally high profile buildings or organizations on campus and no history of past events, the overall risk from international terrorism or national or local civil unrest is low.

If a large explosion were to occur on campus the effects could be devastating. This is especially true if an attack was planned to coincide with an event that concentrated a large population in a single structure.

Modern construction techniques, followed for the last 50 years, have been oriented towards use of lighter but stronger materials. During this time frame engineers have gained increased knowledge about structural integrity of buildings when subjected to horizontal and vertical forces like wind and earthquakes. In earthquakes, the design forces decrease as the weight of the building decreases. Seismic design calls for the building to possess adequate strength so as to resist the repetitive seismic motions in a manner that protects human lives and leaves the building usable, or, at the most, with damage that is easily repairable. When designing for wind and earthquake loads, it is advantageous, especially for the upper levels, to use lightweight nonstructural building materials such as metal stud and drywall partitions instead of masonry.

The dynamic loading on buildings caused by explosions differs in important respects from dynamic loads imposed by earthquake and wind. These latter loads are of relatively low intensity and long duration (seconds to minutes). Explosive loads, by comparison, are extremely large initially and act for very short durations of time (milliseconds). For explosive loads localized in the lower levels, characteristic of terrorist bombing incidents, the lower levels of a structure should be massive to effectively resist the large, short-duration loading. This goal is generally in keeping with seismic requirements where significant strength is called for in the lower levels (CETS 1995).

Many mitigation actions that can reduce losses due to natural hazards can also help reduce the effects of man-made hazards. For example, strengthening windows to reduce wind hazards or strengthening buildings to resist seismic forces may also help mitigate blast forces (FEMA 2003).

MSU-Billings currently has a policy of checking student identification for building access after class hours. There are courtesy phones located on campus that could be used to contact campus security. Security services on campus are referenced in ***Plan Section 4.3.4.***
Campus Security maintains and makes available a workplace violence policy, bomb threat information, the Emergency Action Plan, and the Campus Emergency Action and Crisis Protocol for serious events.

4.6.8 Tornadoes

Tornadoes are the most concentrated and violent storms produced by the earth's atmosphere. They are created by a vortex of rotating wind and strong vertical motion. They possess remarkable strength

and can cause widespread damage. The most violent tornadoes are capable of tremendous destruction with wind speeds of 250 mph or more. Tornadoes are most common in the Great Plains, and are more infrequent and generally small west of the Rockies. Thunderstorms can produce deadly and damaging tornadoes.

Location and Extent of Previous Events

According to the Yellowstone County PDM Plan, Yellowstone County has experienced 31 tornadoes in the past 48 years with a frequency of 0.65 per year.

Probability of Future Events

Due to the frequency of tornadoes in Yellowstone County, the probability can be rated as frequent (less than one event per year but greater than one event every 10 years).

Hazard Effects and Vulnerabilities

Montana has experienced tornadoes, many of which have produced significant damage and occasionally injury or death. A significant tornado could directly affect campus buildings and utilities and those in the surrounding community. The level of damage would be related to the location and size of the tornado's path and each building's ability to withstand the impacts.

To evaluate the financial impact a tornado could have on the MSU-Billings campus two different tornadoes were modeled. Criteria used in the evaluation included:

- The swath of tornado damage looked at was both 40 and 200 meters. This is based on National Weather Service records of typical tornadoes in Montana.
- An "F3" tornado was chosen as it is the highest recorded in Montana. The Fujita Tornado Scale is used by the NWS to estimate wind speeds within tornadoes based upon damage to buildings and structures. F3 tornadoes cause severe damage with roofs and some walls torn off well-constructed houses, most trees uprooted, cars lifted off the ground and thrown, and weak pavement blown off roads.
- A diagonal tornado path across the campus was chosen for the modeling.
- Not all buildings were in the path of the hypothetical tornadoes.

Figure 4-3 shows the path, width and buildings impacted by the two tornadoes.

Risk calculations were determined based on FEMA-342, a building performance assessment that describes loss ratios based on construction class. Buildings constructed with concrete framing were determined to sustain losses equivalent to 10 percent of the building and content value with most of the loss being nonstructural damage to infill walls and roofing. Buildings constructed with steel framing were determined to sustain losses equivalent to 25 percent of the building and content value with most of the loss being some structural damage with significant damage to parts of the building envelope. Masonry construction was determined to sustain 50 percent loss with significant structural and nonstructural damage to walls, roofs and interiors. Wood frame construction was determined to have 70 percent losses. ***Tables 4-3 and 4-4*** show the monetary losses caused by the two tornadoes.

Figure 4-3

TABLE 4-3
40 METER WIDE ESTIMATED TORNADO DAMAGE

Building Number	Name	Stories	Building Type	Building Value	Content Value	Percent Damage	Building Value Loss	Content Value Loss
22	College of Education and Human Services Building	4	Steel	$21,565,232	$5,359,848	25	$5,391,308	$1,339,962
55	Academic Support Center	1	Steel	$1,336,294	$1,310,920	25	$334,073	$327,730
58	Science Hall	2	Steel	$6,915,480	$3,771,995	25	$1,728,870	$942,999
60	McMullen Hall	5	Concrete	$7,207,096	$3,835,640	10	$720,710	$383,564
70	Petro/Rimrock/SUB Complex	7	Concrete	$31,593,848	$6,142,032	10	$3,159,385	$614,203

TABLE 4-4
200 METER WIDE ESTIMATED TORNADO DAMAGE

Building Number	Name	Stories	Building Type	Building Value	Content Value	Percent Damage	Building Value Loss	Building Content Loss
22	College of Education and Human Services Building	4	Steel	$21,565,232	$5,359,848	25	$5,391,308	$1,339,962
47	Library Classroom Building	3	Steel	$11,039,392	$4,643,600	25	$2,759,848	$1,160,900
48	Liberal Arts Building	9	Steel	$14,190,488	$3,788,824	25	$3,547,622	$947,206
53	Physical Ed Building	2	Concrete	$12,610,312	$888,160	10	$1,261,031	$88,816
55	Academic Support Center	1	Steel	$1,336,294	$1,310,920	25	$334,074	$327,730
57	Cisel Hall	3	Steel	$6,058,000	$1,326,000	25	$1,514,500	$331,500
58	Science Hall	2	Steel	$6,915,480	$3,771,995	25	$1,728,870	$942,999
60	McMullen Hall	5	Concrete	$7,207,096	$3,835,640	10	$720,710	$383,564
70	Petro/Rimrock/SUB Complex	7	Concrete	$31,593,848	$6,142,032	10	$3,159,385	$614,203

4.6.9 Volcanic Ash

There are no active volcanoes in Yellowstone County, but an eruption hundreds of miles away could cause volcanic ash to be deposited on the MSU-Billings campus potentially causing health impacts and property damage. There are volcanic areas near Yellowstone County, to the west, in the Cascade Range including Mount St. Helens, Mount Rainer, and Mount Hood, and the Yellowstone Caldera to the southwest. The Yellowstone Caldera in Yellowstone National Park, Wyoming is one of the world's largest active calderas.

Location and Extent of Previous Events

May 19-21, 1980–Mount St. Helens in the Cascade Range in Washington erupted. Volcanic ash was sent high into the atmosphere where high winds carried and deposited the ash to the east. The Governor declared a "State of Emergency" and closed all schools, businesses and government offices. There was much confusion about the closures due to the lower particulate count in eastern Montana (Yellowstone County 2004). Western Montana was hardest hit with ash 4-6 inches deep.

Probability of Future Events

Volcanic eruptions are rare events and are measured on the 100-year scale. It was 26 years ago when Mount St. Helens erupted and deposited ash across Montana. The previous eruption of the Yellowstone Caldera occurred over 665,000 years ago and other volcanic events that deposited ash in Montana occurred over 5,000 years ago. The probability of a volcanic event that affects MSU-Billings is considered to be infrequent (less than one event every 10 years) due to the minimal number of previous events on the campus or in the region.

Hazard Effects and Vulnerabilities

Volcanic ash is made of tiny jagged particles of rock and glass. The ash is corrosive to metals and without proper removal can cause damage to public and private property. The ash is abrasive and can damage vehicular engines. The secondary effects of ash fallout include short-circuits and failure of electronic components such as high voltage circuits and transformers, and interruption of telephone and radio communications. Ash fallout, the ash removal process, and equipment failure can overwhelm communities and the campus. Past volcanic eruptions from the Cascade Range have deposited over six inches across parts of Montana. If combined with rain, heavy wet ash has the potential to collapse roofs. Campus closure from ash fallout would cause economic and educational hardship.

4.6.10 Wind and Severe Thunderstorms including Hail

A windstorm is generally a short duration event involving straight-line wind and/or gusts in excess of 58 mph. Windstorms affect areas with significant tree stands, as well as areas with exposed property, major infrastructure, and aboveground utility lines. Thunderstorms can produce intense downburst and microburst wind. High winds can uproot trees and break limbs causing structural damage.

Hailstorms develop from severe thunderstorms and often occur during the late summer in Yellowstone County. Hail stones are balls of ice that grow as they are held up by winds, known as updrafts, which blow upwards in thunderstorms.

Location and Extent of Previous Events

1987 or 1988 – Wind blew the roof off the Petro Building (public meeting).

June 1991 – Multiple campus buildings sustained hail damage (public meeting).

June 1994 – The Facility Services Shop sustained water damage from heavy rain (public meeting).

July 6, 1997 – An electrical storm caused $2,768 in property damages (Montana Risk and Tort Management Report). Water damage occurred to multiple campus buildings from storm water runoff (public meeting).

June 12, 1998 – Lightning strike caused $14,560 in damages (Montana Risk and Tort Management Report).

July 27, 1998 – A windstorm and heavy rain downed trees and caused $55,106 in damages (Montana Risk and Tort Management Report).

August 1, 2001 – Lightning strike caused $2,506 in damages (Montana Risk and Tort Management Report).

July 7, 2004 – The Tennis Bubble sustained $4,297 worth of wind damage (Montana Risk and Tort Management Report).

July 11, 2006 – Wind downed trees onto buildings causing $12,551 in damages (Montana Risk and Tort Management Report).

Probability of Future Events

During the years 1950 to 2006, 196 hail events and 107 high wind and thunderstorm events occurred in Yellowstone County (NWS). Based on records of past events, the probability of a wind and severe weather event that effects MSU-Billings is considered to be common (greater than one event per year).

Hazard Effects and Vulnerabilities

A windstorm is generally a short duration event involving straight-line wind and/or gusts in excess of 58 mph. Windstorms affect areas with significant tree stands, as well as areas with exposed property, major infrastructure, and aboveground utility lines. Thunderstorms can produce intense downburst and microburst wind. Straight line wind events from thunderstorms produce 85 to 90 percent of wind related damage in central Montana.

Nationally, hailstorms cause nearly $1 billion in property and crop damage annually. Severe hailstorms also cause considerable damage to buildings and automobiles, but rarely result in loss of life. Damages from hail storms in Yellowstone County have included broken windows on homes, animal deaths, power outages, and vehicular damages (NWS 2006). Large windows are vulnerable to shattering during hailstorms causing property damage and personal injury. Hailstorms accompanied by high winds can cause more severe damage than hail alone. Hailstones in Billings have been as large as 3 inches in diameter (NWS 2006). Damage to siding and roofing often occurs during severe hailstorms. Buildings with asphalt shingles are the most vulnerable to hail damage whereas those with tile shingles or metal roofs are considered hail-resistant. Trees and landscaping can be damaged during a strong wind or hailstorm and result in significant debris removal problems.

4.6.11 Winter Storms and Extreme Cold

Winter storms and blizzards follow a seasonal pattern that begins in late fall and lasts until early spring. These storms have the potential to destroy property, and kill people. Winter storms may be categorized as sleet, ice storms or freezing rain, heavy snowfall or blizzards, and low temperatures. Blizzards are severe winter storms with low temperatures, winds of 35 mph or more, blowing snow that reduces visibility to ¼ mile or less that lasts at least three hours.

A severe winter storm is generally a prolonged event involving snow or ice and extreme cold. The characteristics of severe winter storms are determined by the amount and extent of snow or ice, air

temperature, wind speed, and event duration. Severe winter storms create conditions that disrupt essential regional systems such as public utilities, telecommunications, and transportation routes. Serious traffic accidents occur from winter storms and fatalities have resulted when motorists have been stranded in sub-zero conditions. Ice storms accompanied by high winds can have destructive impacts, especially to trees, power lines, and utility services. Power outages caused by freezing spring storms can disrupt electricity for long periods of time.

Table 4-5 lists the coldest days in Billings over the past 75 years. Winter storms have produced over 12 inches of snow in 24 hours and extreme below zero weather occurs each season.

TABLE 4-5
COLDEST DAYS IN BILLINGS, MONTANA 1933 TO 2005

February 15, 1936	-38˚F	December 24, 1983	-32˚F
February 17, 1939	-35˚F	January 12, 1997	-30˚F
February 8, 1936	-33˚F		

Source: National Weather Service (2006)

Location and Extent of Previous Events

December 23, 1996 – Water and steam damage amounting to $3,986 occurred (Montana Risk and Tort Management Report).

January 1, 1997 – Three inches of water flooded the library basement when a water main broke. Water damage was $1447 (Montana Risk and Tort Management Report).

December 31, 2001 – Plants in the science greenhouse were killed due to a frozen pipe break. Damagers were $1,923.44 (Montana Risk and Tort Management Report).

April 1, 2002 – Frozen pipe broke in student housing causing damage was over $40,000 (Montana Risk and Tort Management Report).

October 2005 – Heavy snow caused trees to fall over onto buildings (public meeting).

March 1, 2006 – Pipes froze and burst in the Student Union Building causing water damage (Montana Risk and Tort Management Report).

Probability of Future Events

Severe winter weather and extreme cold temperatures are a common occurrence each season in Billings. The probability of a winter storm event that affects MSU-Billings is considered to be frequent (less than one event per year but greater than one event every 10 years) due to the frequency of previous events on the campus or in the region.

Hazard Effects and Vulnerabilities

Generally, Billings and its residents are prepared for winter weather events, but on occasion, blizzards have overwhelmed the city's ability to keep roads passable. Heavy snow in Billings generally does not cause the campus to shut down or disrupt activities. The most common problem associated with extreme winter weather is poor road conditions that either make roads impassible or cause vehicular

accidents. Winter storms and cold spells typically do not cause major structural damage in Billings, however, heavy snow loads have the potential to collapse roofs and break tree limbs. Utility failure from frozen water/sewer lines and power line failure from heavy snow and ice loads are the greatest threats for MSU-Billings during an extreme cold spell or winter storm. Extreme cold can cause frozen pipes to occur on campus and in turn cause water damage to buildings.

4.7 FUTURE GROWTH

Land use and development trends at MSU-Billings include the construction of new buildings to respond to campus needs, and the upgrade of existing buildings, infrastructure and critical facilities to better protect life safety, address environmental concerns and minimize property damage from hazard events. The MSU-Billings campus is most vulnerable to the following hazards: flooding, hazardous material incidents, structure fire, terrorism-civil unrest-violence, wind-hail-tornadoes, and winter storms-extreme cold. Hazard mitigation will be considered when planning for new construction at MSU-Billings to reduce the effects of hazards on new buildings and infrastructure.

Future development at the MSU-Billings campus includes both new construction and renovation of existing facilities. A new Science/IT building is proposed for the future, as is renovation of McMullan Hall. Purchase of a nearby motel property is being considered with the intention to remodel it into student housing.

5.0 MITIGATION STRATEGIES

Hazard mitigation, as defined by DMA 2000, is any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards. The development of a mitigation strategy allows the campus to create a vision for preventing future disasters, establish a set of mitigation goals, prioritize actions, and evaluate the success of such actions.

Specific mitigation goals and projects were developed for the MSU-Billings campus in conjunction with the Hazard Profile Survey, public meeting and stakeholder interviews. A matrix developed for project ranking emphasizing cost-benefit and input from the campus advisory committee was used to determine project priority. The next section is a description of goals and objectives used to mitigate natural, man-made and technological hazards that build on the campus's existing capabilities. Project implementation and legal framework are discussed at the conclusion of the section.

5.1 GOALS, OBJECTIVES, AND PROPOSED ACTIONS

The plan goals describe the overall direction that MSU-Billings can take to work toward mitigating risk from natural, man made and technological hazards. Goals and objectives of the plan were developed during meetings with the PDM Advisory Committee and stakeholders.

After the he broad range of potential actions in ***Appendix D*** were carefully considered, a list of mitigation objectives and the actions (projects) were identified for MSU-Billings. All projects may not be eligible for FEMA funding; however, MSU-Billings may secure alternate funding sources to implement these projects in the future.

Goal 1: Protect Campus Records from Losses Associated with All Hazards

Objective 1.1: Prevent Loss of Paper and Non-Digital Records.

- Move hard copies of important documents and records out of basements and flood vulnerable areas.
- Install alternate fire suppression system in areas were paper records are stored.
- Establish offsite storage facilities for document backups/archives.

Objective 1.2: Enhance Digital Archiving of Campus Records.

- Develop protocol for digital imaging of administrative records (i.e. HR, payroll, transcripts, financial).
- Provide awareness training to the entire campus on backing up electronic files.

Objective 1.3: Prevent Loss of Digital Records.

- Establish backup for the Banner system at an alternate campus/server.
- Install alternate fire suppression system for the bookstore computer system.

Goal 2: Implement Mitigation Strategies to Enhance Campus Disaster Preparedness

Objective 2.1: Implement Projects to Maintain Continuity of Operations.

- Obtain an emergency generator and transmitter (emergency repeater site) for the KEMC radio station.
- Identify priorities for emergency generators needed for campus critical facilities and obtain generators.
- Install pigtail connections for mobile generators in critical campus facilities.

- Upgrade emergency lighting in stairwells in residence halls.

Objective 2.2: Enhance Awareness on Emergency Shelters and Evacuation Procedures.

- Install signs identifying evacuation routes and emergency shelters.
- Provide awareness training on evacuation procedures (including disability evacuation) and location of emergency shelters.
- Conduct evacuation drills and include persons with disabilities.

Objective 2.3: Conduct Planning/Training Activities to Enhance Preparedness.

- Provide awareness training on emergency response/safety to the whole campus.
- Provide CERT training for the campus Safety Committee.
- Develop a University-wide business continuity plan.
- Develop a University-wide post-disaster recovery plan.
- Develop a PDM Plan for the MSU-Billings Downtown and College of Technology campuses.

Objective 2.4: Enhance Emergency Preparedness on Campus.

- Develop a resource list for emergency services the campus made need in the event of a disaster.

Goal 3: Reduce Vulnerabilities of Campus Buildings and Utilities from Severe Weather

Objective 3.1: Reduce Impacts to Campus Buildings from Trees and Landscaping.

- Conduct landscape inventory to evaluate potential vulnerabilities.
- Develop standards for tree/landscape maintenance.

Objective 3.2: Reduce Injury and Loss Associated with Window Damage.

- Install shatterproof film on windows of existing and future buildings.

Objective 3.3: Reduce Impacts from Power Outages.

- Coordinate an alternative power source for the campus.

Objective 3.4: Coordinate with City for Management of Campus Utilities.

- Provide GIS layer of campus utilities to the City of Billings.
- Explore cooperative agreement with the City for sewer/water line upgrades.

Objective 3.5: Protect Main Telephone Hub that Provides Internet for All Montana Campuses, Billings and Yellowstone County.

- Construct a Safe Room for the Main Telephone Hub on MSU-Billings Campus.

Goal 4: Enhance Campus Awareness of Hazard Mitigation

Objective 4.1: Provide Public Outreach on Risk Reduction for All Hazards.

- Provide education on how to respond when a siren sounds.
- Develop a GIS layer with risk reduction attributes in each campus building.
- Develop a website with blogs for campus risk reduction.
- Coordinate with National Weather Service on hazards/risk reduction awareness training for faculty, staff, and students.
- Provide education on risk reduction and safety to students in the syllabus every year.

Goal 5: Enhance Early Warning Systems on Campus

Objective 5.1: Implement Techniques to Alert Campus Population of Pending Hazard Events.

- Obtain NOAA weather radios for critical facilities.
- Obtain visual alarms such as LCD clocks for classrooms that can broadcast emergency alerts.
- Develop an instant message system for cell phones and computers to provide emergency alerts.
- Consider a multimedia early warning system and coordinate with local media to provide updates and information.

Goal 6: Reduce Impacts from Flooding

Objective 6.1: Reduce Flooding Impacts from Irrigation Ditch.

- Consider a structural project to reduce flooding impacts from the irrigation ditch that flows through the campus.

5.2 PROJECT RANKING AND PRIORITIZATION

Each of the proposed projects has value, however, time and financial constraints do not permit all projects to be implemented immediately. By prioritizing the actions, the most critical, cost effective projects can be achieved in the short term.

A cost-benefit matrix was developed to rank the mitigation projects. Each project was assigned a "high", "medium", or "low" rank for *Population Impacted, Property Impacted*, *Project Feasibility* and *Project Cost.*

- For the ***Population Protected*** category, a "high" rank means more than 50 percent of the campus population would be protected by implementation of the mitigation strategy. A "medium" rank means 20 to 50 percent of campus population would be protected, and, a "low" rank means less than 20 percent would be protected.

- For the ***Property Protected*** category, a "high" means more than $500,000 worth of property would be protected through implementation of the mitigation strategy. "Medium" means $100,000 to $500,000 worth of property would be protected, and, "low" means less than $100,000 worth would be protected.

- Since the primary "product" provided by universities is the service of education and training, continuity of service is a primary asset that mitigation planning needs to address. For the ***Services Impacted*** category, a "high" means continuity of campus services would be maintained on more than 50 percent of the campus by implementation of the mitigation strategy. A "medium" rank means 20 to 50 percent of campus services would be maintained, and, a "low" rank means less than 20 percent would be maintained.

- For the *Project Feasibility* category a "high" rank means technology is available and implementation is likely. A "medium" rank means technology may be available but implementation could be difficult, and, a "low" rank means no technology is available or implementation would be unlikely.

- For the ***Project Cost*** category, a "high" means the mitigation project would cost more than $500,000. "Medium" means the project cost would be between $100,000 and $500,000, and, "low" means the project would cost less than $100,000.

The matrix was completed by assigning each rank a numeric value as shown in ***Table 5-1***:

TABLE 5-1
COST-BENEFIT SCORING MATRIX

	Population Protected	Property Protected	Services Impacted	Project Feasibility	Cost
High	5	5	5	5	1
Medium	3	3	3	3	3
Low	1	1	1	1	5

The overall cost-benefit was calculated by summing the total score for each project. ***Table 5-2*** shows the Hazard Mitigation Project Cost-Benefit Matrix for MSU-Billings mitigation projects. Projects identified by MSU-Billings as top priorities based on cost/benefit ranking are shown in ***Table 5-3.*** The prioritization of the projects serves as a guide for choosing and funding projects, however, depending on the funding sources, some actions may be best achieved outside the priorities established here.

5.3 PROJECT IMPLEMENTATION

Cooperating organizations for project implementation may include campus programs, utility companies, and local or county agencies that are capable of, or responsible for, implementing activities and programs. The PDM Advisory Committee chairperson will be responsible for mitigation project administration. Other departments and agencies responsible for mitigation project implementation are identified in ***Table 5-3*** along with a project implementation schedule.

Although a number of the mitigation projects listed in ***Plan Section 5.1*** may not be eligible for FEMA-PDM funding, MSU-Billings may secure alternate funding sources to implement these projects in the future, including federal and state grant programs, and funds made available through Yellowstone County. Alternate funding sources may include:

Federal Government

- Department of Homeland Security grants

State Government–Montana University System

- State funding through Board of Regents–would require legislative action
- Montana University System Long-Range Building Plan
- MSU-Billings operating budget

Local Government

- Yellowstone County Disaster and Emergency Services–in kind services
- City of Billings Operating Budget–in kind services

Private Business and Organizations

- MSU-Billings Foundation
- MSU-Billings Alumni
- Corporate businesses in Billings that hire MSU-Billings graduates
- Utility companies

TABLE 5-2
MSU-BILLINGS COST/BENEFIT RANKING OF HAZARD MITIGATION PROJECTS

GOAL	OBJECTIVE	PROJECT	HAZARD(S) MITIGATED	POPULATION PROTECTED	PROPERTY PROTECTED	SERVICES IMPACTED	PROJECT FEASIBILITY	COST	COST/BENEFIT RANKING
Goal 1: Protect Campus Records from Losses Associated with All Hazards	Objective 1.1: Prevent Loss of Paper and Non-Digital Records	Move hard copies of important documents and records out of basements and flood vulnerable areas.	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Low	High	Medium	High	Medium	Medium (17)
		Install an alternate fire suppression system in areas were paper records are stored.	Structure Fire	Low	High	Medium	High	Low	Medium (19)
		Establish an offsite storage facility for document backups/archives.	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Low	High	Low	High	Medium/ Low	Medium (16)
	Objective 1.2: Enhance Digital Archiving of Campus Records	Develop protocol for digital imaging of administrative records (i.e. HR, payroll, transcripts, financial).	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	High	High	Low	High	Low	Medium (21)
		Provide awareness training to the entire campus on backing up electronic files.	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	High	Medium	High	High	Low	High (23)
	Objective 1.3: Prevent Loss of Digital Records	Establish a backup for the Banner system at alternate campus/server.	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	High	High	High	High	High	Medium (21)
		Install an alternate fire suppression system for Bookstore computer system.	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Medium	High	Medium	High	Low	Medium (21)
	Objective 1.4: Prevent Loss of Important Collections and Intellectual Property	Consider alternate fire suppression systems in departmental libraries (i.e. herbarium collection in Science building).	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	High	High	Medium	High	Medium	Medium (21)
		Develop a policy to safeguard intellectual property in faculty offices and labs.	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Medium	High	High	High	Low	High (23)
Goal 2: Implement Mitigation Strategies to Enhance Campus Disaster Preparedness	Objective 2.1: Implement Projects to Maintain Continuity of Operations	Obtain an emergency generator and transmitter (emergency repeater site) for the KEMC radio station	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	High	High	High	High	Medium	High (23)
		Identify priorities for emergency generators needed for campus critical facilities and obtain generators.	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	High	High	High	High	Low	High (25)

TABLE 5-2
MSU-BILLINGS COST/BENEFIT RANKING OF HAZARD MITIGATION PROJECTS

GOAL	OBJECTIVE	PROJECT	HAZARD(S) MITIGATED	POPULATION PROTECTED	PROPERTY PROTECTED	SERVICES IMPACTED	PROJECT FEASIBILITY	COST	COST/BENEFIT RANKING
Goal 2: Implement Mitigation Strategies to Enhance Campus Disaster Preparedness	Objective 2.1: Implement Projects to Maintain Continuity of Operations	Install pigtail connections in critical campus facilities for a mobile generator.	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	High	Low	High	High	Medium	Medium (19)
		Upgrade emergency lighting in stairwells in residence halls.	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Low	Low	Low	High	Low	Low (13)
	Objective 2.2: Enhance Awareness on Emergency Shelters and Evacuation Procedures	Install signs identifying evacuation routes and emergency shelters.	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	High	Low	Low	High	Low	Medium (17)
		Provide awareness training on evacuation procedures (including disability evacuation) and location of emergency shelters through both oral and written presentations.	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	High	Low	Low	High	Low	Medium (17)
		Conduct evacuation drills and include persons with disabilities.	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	High	Low	Low	High	Low	Medium (17)
	Objective 2.3: Conduct Planning/Training Activities to Enhance Preparedness	Provide awareness training on emergency response/safety to the whole campus.	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	High	Low	Low	High	Low	Medium (17)
		Provide CERT training for the campus Safety Committee.	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Low	Low	Low	High	Low	Low (13)
		Develop a University-wide business continuity plan.	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	High	Low	High	High	Low	Medium (21)
		Develop a University-wide post-disaster recovery plan.	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	High	Low	High	High	Low	Medium (21)
		Develop a PDM Plan for the MSU-Billings Downtown and College of Technology campuses.	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Medium	Low	Medium	High	Low	Medium (17)

TABLE 5-2
MSU-BILLINGS COST/BENEFIT RANKING OF HAZARD MITIGATION PROJECTS

GOAL	OBJECTIVE	PROJECT	HAZARD(S) MITIGATED	POPULATION PROTECTED	PROPERTY PROTECTED	SERVICES IMPACTED	PROJECT FEASIBILITY	COST	COST/BENEFIT RANKING
Goal 2: Implement Mitigation Strategies to Enhance Campus Disaster Preparedness	Objective 2.4: Enhance Emergency Preparedness on Campus	Develop a resource list for emergency services campus may need in the event of a disaster.	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	High	Low	High	High	Low	Medium (21)
Goal 3: Reduce Vulnerabilities of Campus Buildings and Utilities from Severe Weather	Objective 3.1: Reduce Impacts to Campus Buildings from Trees and Landscaping	Conduct a landscape inventory to evaluate potential vulnerabilities.	Wind-Hail, Winter Storms-Extreme Cold	Low	High	Medium	High	Low	Medium (19)
		Develop standards for tree/landscape maintenance.	Wind-Hail, Winter Storms-Extreme Cold	Low	High	Medium	High	Low	Medium (19)
	Objective 3.2: Reduce Injury and Loss Associated with Window Damage	Install shatterproof film on windows of existing and future buildings.	Wind-Hail	High	High	Low	High	Low	Medium (21)
	Objective 3.3: Reduce Impacts from Power Outages	Coordinate an alternative power source for the campus.	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	High	High	High	Medium	High	Medium (19)
	Objective 3.4: Coordinate with City for Management of Campus Utilities	Provide GIS layer of campus utilities to the City of Billings.	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Low	Low	High	High	Low	Medium (17)
		Explore cooperative agreement with the City for sewer/water line upgrades.	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Low	High	Medium	Medium	High	Low (13)
	Objective 3.5: Protect Main Telephone Hub that Provides Internet for All Montana Campuses, Billings and Yellowstone County	Construct a Safe Room for the Main Telephone Hub on MSU-Billings Campus.	Flooding, Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Low	High	High	High	Medium	Medium (19)
Goal 4: Enhance Campus Awareness of Hazard Mitigation	Objective 4.1: Provide Public Outreach on Risk Reduction for All Hazards	Provide education on how to respond when a siren sounds.	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	High	Low	Low	High	Low	Medium (17)
		Develop a GIS layer with risk reduction attributes for each campus building	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Low	Low	Low	High	Low	Low (13)

TABLE 5-2
MSU-BILLINGS COST/BENEFIT RANKING OF HAZARD MITIGATION PROJECTS

GOAL	OBJECTIVE	PROJECT	HAZARD(S) MITIGATED	POPULATION PROTECTED	PROPERTY PROTECTED	SERVICES IMPACTED	PROJECT FEASIBILITY	COST	COST/BENEFIT RANKING
Goal 4: Enhance Campus Awareness of Hazard Mitigation	Objective 4.1: Provide Public Outreach on Risk Reduction for All Hazards	Develop a website with blogs for campus risk reduction.	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	High	Low	Low	High	Low	Medium (17)
		Coordinate with the National Weather Service on hazards/risk reduction awareness training for faculty, staff, and students.	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	High	Low	Low	High	Low	Medium (17)
		Provide education on risk reduction and safety to students in the syllabus (or alternate formats) every year.	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	High	Low	Low	High	Low	Medium (17)
Goal 5: Enhance Early Warning Systems on Campus	Objective 5.1: Implement Techniques to Alert Campus Population of Pending Hazard Events	Obtain NOAA weather radios for critical facilities.	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	High	Low	Low	High	Low	Medium (17)
		Obtain visual alarms such as LCD clocks for classrooms that can broadcast emergency alerts.	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	High	Low	Low	High	Low	Medium (17)
		Develop instant message system for cell phones and computers to provide emergency alerts.	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	High	Low	Low	High	Low	Medium (17)
		Consider a multimedia early warning system and coordinate with local media to provide updates and information.	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	High	Low	Low	Medium	Medium	Low (13)
Goal 6: Reduce Impacts from Flooding	Objective 6.1: Reduce Flooding Impacts from Irrigation Ditch	Consider structural project to reduce flooding impacts from the irrigation ditch that flows through campus.	Flooding	Low	Low	Low	Medium	Medium	Low (9)

POPULATION PROTECTED	PROPERTY PROTECTED & COST	SERVICES IMPACTED	PROJECT FEASIBILITY	COST/BENEFIT RANKING
High = > 50% of campus residents	High = > $500,000	High = > 50% of campus affected	High = Technology available and implementation likely	High = 25 to 22
Medium = 20 to 50% of campus residents	Medium = $100,000 to $500,000	Medium = 20 to 50% of campus affected	Medium = Technology may be available but implementation could be difficult	Medium = 21 to 16
Low = < 20% campus residents	Low = < $100,000	Low = < 20% of campus affected	Low = No technology available or implementation unlikely	Low = 15 to 5

TABLE 5-3
MSU-BILLINGS PRIORITY MITIGATION PROJECTS,
IMPLEMENTATION SCHEDULE AND POTENTIAL FUNDING SOURCES

Campus Priority	Cost/Benefit Ranking (Score)	Project	Hazard(s) Mitigated	Implementation Schedule	Responsible for Implementation	Possible Funding Sources
I	High (25)	Identify priorities for emergency generators needed for campus critical facilities and obtain generators.	Flooding, Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Year 1-2	Facilities	Montana University System appropriation, Campus operating budget
I	High (23)	Obtain an emergency generator and transmitter (emergency repeater site) for the KEMC radio station.	Flooding, Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Year 1-2	Facilities	Montana University System appropriation, Campus operating budget
I	Medium (21)	Develop protocol for digital imaging of administrative records (i.e. HR, payroll, transcripts, financial).	Flooding, Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Year 1-2	IT, Others	Campus operating budget
I	Medium (21)	Establish a backup for the Banner system at alternate campus/server.	Flooding, Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Year 1-2	Montana University System, IT	Montana University System appropriation
I	Medium (19)	Construct a Safe Room for Main Telephone Hub on MSU-Billings Campus.	Flooding, Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Year 1-2	Facilities, IT	Montana University System appropriation, campus operating budget, City-County in-kind, FEMA-PDM
I	Medium (17)	Provide awareness training on emergency response/safety to the whole campus.	Flooding, Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Year 1-2	Safety Committee	Campus operating budget
I	Low (13)	Provide CERT training for the campus Safety Committee.	Flooding, Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Year 1-2	Safety Committee, Yellowstone County DES	Campus operating budget, Yellowstone County DES
I	Medium (17)	Provide education on risk reduction and safety to students in the syllabus (or alternate formats) every year.	Flooding, Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Year 1-2	Safety Committee, , Academic Vice Chair, Provost	Campus operating budget
I	Medium (17)	Provide awareness training on evacuation procedures (including disability evacuation) and location of emergency shelters through both oral and written presentations.	Flooding, Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Year 1-2	Safety Committee	Campus operating budget
-	Medium (17)	Conduct evacuation drills and include persons with disabilities.	Flooding Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Year 1-2	Safety Committee	Campus operating budget
-	High (23)	Provide awareness training to the entire campus on backing up electronic files.	Flooding, Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Year 1-2	IT	Campus operating budget
-	Medium (21)	Install an alternate fire suppression system for the Bookstore computer system.	Flooding, Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Year 3-4	IT, Bookstore	Montana University System appropriation, Campus operating budget

TABLE 5-3
MSU-BILLINGS PRIORITY MITIGATION PROJECTS,
IMPLEMENTATION SCHEDULE AND POTENTIAL FUNDING SOURCES

Campus Priority	Cost/Benefit Ranking (Score)	Project	Hazard(s) Mitigated	Implementation Schedule	Responsible for Implementation	Possible Funding Sources
-	Medium (21)	Develop a University-wide business continuity plan.	Flooding, Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Year 3-4	Cabinet	Homeland Security, FEMA-PDM
-	Medium (21)	Develop a University-wide post-disaster recovery plan.	Flooding, Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Year 3-4	Cabinet	Homeland Security, FEMA-PDM
-	Medium (21)	Develop a resource list for emergency services the campus may need in the event of a disaster.	Flooding, Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Year 3-4	Safety Committee, Red Cross	Campus operating budget
-	Medium (21)	Install shatterproof film on windows on existing and future buildings.	Wind-Hail	Year 3-4	Facilities	FEMA-PDM
-	Medium (19)	Install an alternate fire suppression system in areas were paper records are stored.	Structure Fire	Year 3-4	Facilities	Montana University System appropriation, Campus operating budget
-	Medium (19)	Install pigtail connections in critical campus facilities for a mobile generator.	Flooding, Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Year 3-4	Facilities	Montana University System appropriation, Campus operating budget
-	Medium (19)	Conduct a landscape inventory to evaluate potential vulnerabilities.	Wind-Hail, Winter Storms-Extreme Cold	Year 3-4	Facilities	Campus operating budget
-	Medium (19)	Develop standards for tree/landscape maintenance.	Wind-Hail, Winter Storms-Extreme Cold	Year 3-4	Facilities	Campus operating budget
-	Medium (19)	Coordinate an alternative power source for campus.	Flooding, Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Year 5-6	Facilities	Montana University System appropriation, Northwestern Energy in-kind
-	Medium (17)	Move hard copies of important documents and records out of basements and flood vulnerable areas.	Flooding, Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Year 1-2	Facilities	Campus operating budget
-	Medium (17)	Install signs identifying evacuation routes and emergency shelters.	Flooding, Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Year 3-4	Facilities, Red Cross	Campus operating budget
-	Medium (17)	Develop a PDM Plan for the MSU-Billings Downtown and College of Technology campuses.	Flooding, Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Year 3-4	Safety Committee, College of Technology, Dean of Downtown Campus	FEMA-PDM
-	Medium (17)	Provide GIS layer of campus utilities to the City of Billings.	Flooding, Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Year 3-4	Facilities	Campus operating budget
-	Medium (17)	Provide education on how to respond when a siren sounds.	Flooding, Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Year 5-6	Safety Committee, Yellowstone County DES	Campus operating budget

TABLE 5-3
MSU-BILLINGS PRIORITY MITIGATION PROJECTS,
IMPLEMENTATION SCHEDULE AND POTENTIAL FUNDING SOURCES

Campus Priority	Cost/Benefit Ranking (Score)	Project	Hazard(s) Mitigated	Implementation Schedule	Responsible for Implementation	Possible Funding Sources
-	Medium (17)	Develop a website with blogs for campus risk reduction.	Flooding, Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Year 5-6	IT, Safety Committee	Campus operating budget
-	Medium (17)	Coordinate with the National Weather Service on hazards/risk reduction awareness training for faculty, staff, and students.	Flooding, Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Year 5-6	NWS, Safety Committee	Campus operating budget
-	Medium (17)	Obtain NOAA weather radios for critical facilities.	Flooding, Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Year 5-6	NWS, Safety Committee	FEMA-PDM
	Medium (17)	Obtain visual alarms such as LCD clocks for classrooms that can broadcast emergency alerts.	Flooding, Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Year 5-6	Facilities, Safety Committee	Campus operating budget, FEMA-PDM
-	Medium (17)	Develop instant message system for cell phones and computers to provide emergency alerts.	Flooding, Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Year 5-6	IT, Safety Committee	Campus operating budget
-	Medium (16)	Establish offsite storage facility for document backups/archives.	Flooding, Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Year 1-2	Facilities	Montana University System appropriation, Campus operating budget
-	Low (13)	Upgrade emergency lighting in stairwells in residence halls.	Flooding, Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Year 5-6	Facilities	Montana University System appropriation, Campus operating budget
-	Low (13)	Explore a cooperative agreement with the City for sewer/water line upgrades	Flooding, Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Year 5-6	Facilities, City of Billings	State funding through Board of Regents, City of Billings in-kind
-	Low (13)	Develop GIS layer with risk reduction attributes for each campus building.	Flooding, Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Year 5-6	Risk Management, Loss Prevention	Campus operating budget
-	Low (13)	Consider a multimedia early warning system and coordinate with local media to provide updates and information.	Flooding, Hazardous Materials, Structure Fire, Terrorism, Wind-Hail, Winter Storms-Extreme Cold	Year 5-6	IT, Safety Committee	Montana University System appropriation, Campus operating budget, FEMA-PDM
-	Low (9)	Consider a structural project to reduce flooding impacts from the irrigation ditch that flows through the campus.	Flooding	Year 5-6	City of Billings	FEMA-PDM

5.4 LEGAL FRAMEWORK

A number of state and local regulations and policies form the legal framework available to implement MSU-Billings hazard mitigation goals and projects.

Federal

- The Federal Civil Defense Act of 1950
- Public Law 96-342, The Improved Civil Defense Act of 1980
- Public Law 91-606, Disaster Relief Act
- Public Law 93-288, The Robert T. Stafford Disaster Relief Act of 1974
- Presidential Executive Order 11988, Floodplain Management
- Presidential Executive Order 11990, Protection of Wetlands

State of Montana

- Montana Code Annotated, Title 10, Chapter 3, Disaster and Emergency Services
- Montana Code Annotated, Title 76, Chapter 5, Flood Plain and Floodway Management
- Montana Code Annotated, Title 50, Chapter 60, Building Construction Standards
- Montana Code Annotated, Title 76, Chapter 2, Planning and Zoning

Yellowstone County

- Yellowstone County PDM Plan (2004)
- Yellowstone County Emergency Operations Plan

City of Billings

- City of Billings Municipal Code

Montana State University - Billings

- Emergency Response Plan
- Campus Master Plan
- University Safety Committee–Mission Statement
- Campus Police–Mission Statement
- Hazard Communication Program–OSHA

6.0 PLAN MAINTENANCE PROCEDURES

The plan maintenance section of this document details the formal process that will ensure that the MSU-Billings PDM Plan remains an active and relevant document. The plan maintenance process includes a schedule for monitoring and evaluating the plan and producing a plan revision every five years. This section describes how MSU-Billings will integrate public participation throughout the plan maintenance process. Also included in this section is an explanation of how MSU-Billings intends to incorporate the mitigation strategies outlined in this plan into existing planning mechanisms.

6.1 MONITORING, EVALUATING AND UPDATING THE PLAN

The MSU-Billings PDM Plan will be reviewed every two years, or as deemed necessary by knowledge of new hazards, vulnerabilities, or other pertinent reasons. The review will determine whether a plan update is needed prior to the required five year update. The plan review will identify new mitigation projects and evaluate the effectiveness of mitigation priorities and existing programs.

The chairperson of the MSU-Billings PDM Advisory Committee will be responsible for scheduling a meeting of the committee to review and update the plan. The meeting will be open to the public and advertised in the local newspaper to solicit public input. The committee, campus stakeholders and public will also review the risk assessment portion of the plan to determine if this information should be updated or modified, given any new available data. The Advisory Committee chairperson will produce a status report detailing the success of various mitigation projects, difficulties encountered, success of coordination efforts, and which strategies should be revised. The status report will be published in the campus and local newspapers to update the campus population and local citizens.

The PDM Advisory Committee chairperson will be responsible for the five year plan update and will have six months to make appropriate changes to the plan before submitting it to the committee, campus stakeholders and public for review and approval. Before the end of the five-year period, the updated plan will be submitted to the Montana State Hazard Mitigation Officer and FEMA for acceptance. The Advisory Committee chairperson will notify all holders of the PDM Plan when changes have been made.

6.2 IMPLEMENTATION THROUGH EXISTING PROGRAMS

MSU-Billings will have the opportunity to implement hazard mitigation projects through existing programs and procedures. Campus stakeholders will work with the PDM Advisory Committee to ensure hazard mitigation projects are consistent with planning goals and integrate them, where appropriate.

MSU-Billings uses a Strategic Plan and Long Range Building Plan to guide and control campus development and maintenance of existing facilities. The university will require that hazards be addressed in these plans, and, specifically, that life and property be protected from natural disasters and man-caused hazards. The PDM Advisory Committee will conduct periodic reviews of campus plans and policies to ensure that hazard mitigation is being incorporated where appropriate. Campus capital improvements will also contribute to the goals in the PDM Plan. The PDM Advisory Committee will work with capital improvement planners to ensure that high-hazard areas are being considered for low risk uses.

To ensure that the requirements of the PDM Plan hazard mitigations are incorporated into other planning mechanisms and remain an on-going concern on campus, job descriptions of various campus staff will be enhanced to include a mitigation component. Job descriptions of the Facility Services Director, Risk Management Director, Campus Police Chief and Safety Officer will be modified to include

responsibilities for implementing outreach activities for risk reduction on campus, coordinating with the Board of Regents to secure funding for mitigation projects, reviewing amendments to the Strategic Plan and Long Range Building Plan and updating the campus PDM Plan.

Meetings of the PDM Advisory Committee will provide an opportunity to report back on the progress made on the integration of mitigation planning elements into campus planning documents and procedures.

6.3 CONTINUED PUBLIC INVOLVEMENT

MSU-Billings is dedicated to involving the campus population and public directly in review and updates of the PDM Plan. The campus population and public will have many opportunities to provide feedback about the plan. Copies of the plan will be cataloged and kept at all appropriate departments on the MSU-Billings campus as well as at the Library. The existence and location of these copies will be publicized in the campus newspaper. ***Plan Section 3.0*** includes the address and the phone number of the PDM Advisory Committee chairperson responsible for keeping track of public comments on the plan.

A series of public meetings will also be held prior to the five year update, or at lesser intervals when deemed necessary by the PDM Advisory Committee. The meetings will provide the campus population and public a forum through which they can express concerns, opinions, or ideas about the plan. The PDM Advisory Committee chairperson will be responsible for using campus resources to publicize the public meetings and maintain public involvement through the newspapers and radio.

7.0 REFERENCES

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