Pre-Disaster Mitigation Plan
Montana Tech UM - Butte

MontanaTech
THE UNIVERSITY OF MONTANA

FEMA

December 2013

TETRA TECH

PRE-DISASTER MITIGATION PLAN
2013 UPDATE

MONTANA TECH OF
THE UNIVERSITY OF MONTANA
NORTH CAMPUS AND HIGHLANDS COLLEGE
BUTTE, MONTANA

***Prepared for*:**

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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.

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. The 2013 update of the Montana Tech PDM Plan identifies the potential hazards that the campus faces and assesses the vulnerability to the campus population and built environment. 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.

Top hazards potentially affecting the Montana Tech campus include:

1 – Severe Winter Weather
2 – Severe Summer Weather
3 – Utility Interruption
4 – Earthquake
5 – Hazardous Material Incidents
6 – Structure Fire
7 – Communicable Disease
8 – Terrorism & Violence
9 – Volcanic Eruption

The PDM Advisory Committee updated goals, objectives and projects to mitigate the effects of hazard events on the Montana Tech campus. Top priority mitigation projects are:

- Conduct seismic evaluation of all buildings on campus.
- Conduct seismic evaluation of utility tunnels which distribute fiber optic, water, telephone, electrical and steam to campus buildings.
- Identify non-structural mitigation projects within all campus buildings. Evaluate offices, departmental libraries for secure shelving.
- Install central shut-off for all natural gas on campus.

- Evaluate campus buildings for compliance with fire codes.
- Implement off-site storage for back-ups of digital records.
- Establish protocol for cyber security to prevent theft of sensitive student information and intellectual property.
- Establish fiber redundant loop to protect electronic delivery of campus records.
- Install efficient cooling system for data and communications systems.
- Obtain emergency generator for campus demark in Centennial Hall and MBMG server room in Natural Resource Building
- Update the campus Emergency Action & Crisis Protocol Manual.
- Establish coordination protocol between Montana Tech campus and Butte-Silver Bow Sheriff's and Fire Departments
- Establish number system for all rooms and mark room numbers on doors.

Mitigation projects completed since the original Montana Tech PDM Plan was completed in 2007 include:

- Tier 1 seismic evaluations were completed for 13 campus buildings. A Tier 2 seismic study was completed on Main Hall.
- Alternate fire suppression was installed for data and communications systems.
- A PDM Plan (this document) was prepared to include the Highlands College and family housing.

Montana Tech's capabilities to implement mitigation projects include planners, engineers, scientists, GIS personnel, and financial and administrative professionals, both within Montana Tech and associated with state and local partners. Capabilities within Montana Tech include: the Office of Environmental Health and Safety, Safety Committee, and Department of Physical Facilities. Outside partners that enhance Montana Tech's capabilities include the Montana Department of Administration, Architecture and Engineering Division and the Butte-Silver Bow County Local Emergency Planning Committee.

This PDM Plan will be adopted by the Chancellor of Montana Tech, which will allow Montana Tech to continue to be eligible to apply 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 the effectiveness of mitigation projects and existing programs at Montana Tech.

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LIST OF ACRONYMNS

A&E	Architecture and Engineering (Division)
ASCE	American Society of Civil Engineers
BAT	Behavior Assessment Team
CPRI	Calculated Priority Risk Index
CERT	Community Emergency Response Team
CDC	Center for Disease Control
DES	Disaster and Emergency Services
DMA	Disaster Mitigation Act
DPHHS	Department of Public Health and Human Services
DRU	Disaster Resistant University
DW	DrillerWeb
EPCRA	Emergency Planning and Community Right-to-Know Act
FEMA	Federal Emergency Management Agency
GIS	Geographic Information System
GWIC	Ground-Water Information Center
HAZUS-MH	Hazards of the United States – Multi-Hazard
HMGP	Hazard Mitigation Grant Program
HPER	Health Physical Education and Recreation Complex
HVAC	Heating Ventilation and Air Conditioning
IBC	International Building Code
IT	Information Technology
LEPC	Local Emergency Planning Committee
MBMG	Montana Bureau of Mines and Geology
DOA	Montana Department of Administration
NCDC	National Climatic Data Center
NRB	Natural Resources Building
PCIIS	Property Casualty Insurance Information System
NFPA	National Fire Protection Association
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service
OSHA	Occupational Safety and Health Administration
PDM	Pre-Disaster Mitigation
PDMC	Pre-Disaster Mitigation Competitive
PGA	Peak Ground Acceleration
RMTD	Risk Management and Tort Defense
SHELDUS	Spatial Hazard Events and Losses Database for the United States
SHMO	State Hazard Mitigation Officer
TAT	Threat Assessment Team

LIST OF ACRONYMNS

UBC	Uniform Building Code
UM	University of Montana
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. Montana Tech of the University of Montana, working in conjunction with Montana Disaster and Emergency Services (DES) and Tetra Tech Inc. prepared this 2013 update to their Pre-Disaster Mitigation (PDM) Plan to help guide and focus hazard mitigation actions. The Plan provides a list of mitigation projects that will assist Montana Tech in reducing risk and preventing loss from future hazard events. The 2013 PDM Update includes the Montana Tech North Campus in uptown Butte, the Highlands College (formerly the College of Technology) and the Mineral Resource Center, both located south of Butte, on Basin Creek Road.

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 Montana Tech PDM Advisory Committee, this PDM Plan will be adopted by the Chancellor of Montana Tech of the University of Montana 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 Montana Tech PDM Plan.

1.2 ACKNOWLEDGEMENTS

Many groups and individuals contributed to the update of the Montana Tech PDM Plan; in particular, the Montana Tech PDM Plan Advisory Committee which provided support for all aspects of plan

development. Faculty, staff, and students participated in the planning process by attending public meetings and reviewing and commenting on the draft Plan.

1.3 SCOPE AND PLAN ORGANIZATION

The process followed to update the Montana Tech PDM Plan included the following:

- Update and re-prioritize disaster events that are most probable and destructive,
- Update list of campus critical facilities,
- Identify areas within the campus that are most vulnerable,
- Update goals and objectives for reducing the effects of a disaster event,
- Update specific projects to be implemented for each goal and track progress made,
- Update procedures for monitoring progress and updating the Plan, and
- Adopt the Plan.

The Plan is organized into sections that describe the Planning Process (Section 2), Campus Profile (Section 3), Risk Assessment (Section 4), Mitigation Strategies (Section 5), Capability Assessment (Section 6), and Plan Maintenance Procedures (Section 7). Appendices containing supporting information are included at the end of the Plan.

2.0 PLANNING PROCESS

The 2013 update of Montana Tech's PDM Plan 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 for the PDM Plan update began approximately on February 1, 2013 and lasted approximately 12 months. The planning process was facilitated by the contractor, Tetra Tech.

2.1 PDM ADVISORY COMMITTEE

The PDM advisory committee was re-convened at the initiation of the project. The Montana Tech PDM Advisory Committee consisted of campus staff involved in administration, health and safety, facility maintenance, information technologies and risk management, and a member of student government. Members of the PDM Advisory Committee are shown in **Table 2.1-1.**

TABLE 2.1-1
MONTANA TECH PDM ADVISORY COMMITTEE

Name	Position
Marilyn Cameron, Chair	Director of Environmental Health & Safety
Amanda Badovinac	Director Public Relations
Paul Beatty	Associate VC for Student Affairs/Dean of Students
Don Blackketter	Chancellor
Scott Forthofer	Director Residence Life
Bev Hartline	VC for Research
John Jackam	Trades and Technical Dept, Highlands College
Joe Kujawa	Director Telecommunications
Mike Kukay	Director Network Services
Jeanne Larson	Chair Safety Committee, Lab Director Environmental Engineering
Joe McClafferty	VC for Development & University Relations
John Metesh	Director Montana Bureau of Mines & Geology
Mike Nasheim	Acting Director Physical Facilities
Maggie Peterson	Director of Budget and Human Services
Mike Stickney	Research Professor/Earthquake Studies

Members of the PDM Advisory Committee attended meetings, reviewed hazards and identified concerns, provided details on progress made and activities planned for mitigation actions, and reviewed and revised the plan. The PDM Advisory Committee received a variety of information during the planning and review process including the hazard ranking matrix, campus building characteristics, meeting notifications and mitigation strategy documents for review.

2.2 PROJECT STAKEHOLDERS

The PDM planning process was initiated by preparing a stakeholders 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 local law enforcement, fire department, police department, public works, health department, community development, superintendent of schools, and county commissioners. State agencies included the State Hazard Mitigation Officer, DES Region 1 Representative and Highway Patrol. Utilities involved in the planning process included NorthWestern Energy. Business entities invited to participate in the planning effort included the St. James Healthcare and REC Silicon. Most entities participated by attending the public meetings and several offered comments on the draft plan.

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** presents the PDM Stakeholders list.

2.3 EXISTING PLANS, STUDIES AND POLICIES

At the initiation of the update project, all new planning documents, studies, reports, technical information and policies relevant to hazard mitigation were reviewed and incorporated into the PDM document, as appropriate. These documents included:

- Butte Silver Bow City/County, Montana Hazard Mitigation Plan, 2010 Update
- Tier 1 & 2 Seismic Evaluations of Montana Tech Buildings, 2011 & 2012
- Montana Tech Emergency Notification Plan, 2012
- Montana Tech Emergency Action & Crisis Protocol Manual, 2012
- Montana Tech Hazard Communication Program, 2006
- Montana Tech Safety Policy, 2011
- Montana Tech Cold Weather Policy and Procedures (2012)
- Montana Tech Bloodborne Program, 2006
- Montana Tech Bloodborne Pathogen Student Policy, 2006
- Montana Tech Bomb Threat Checklist
- Montana Tech Chemical Hygiene Plan
- Montana Tech Earthquake Flyer, 2004
- Montana Tech Hazardous Chemical Releases and Spills
- Montana Tech Hazardous Waste Management
- Montana Tech Lab Checkout, 2010
- Montana Tech Radiation Emergency Response Procedures
- Montana Tech Radiation Safety Manual, 2005
- Montana Tech Workplace Violence

2.4 PROJECT WEBSITE

A website was setup at the start of the project to provide information to project stakeholders and the students, faculty and staff of Montana Tech. The project website can be viewed at: www.universitypdm.com. The website remained active during the course of the project through adoption of the plan.

The website contained a Home page and pages for: Contacts, Advisory Committee, Meetings, Draft Plan, Forms, and References. The Home page contained a letter inviting participation in update of the campus PDM plan. The Contacts page contained information on Tetra Tech and University personnel involved in management of the project. The Advisory Committee page contained materials for review prior to conference calls. The Meetings page contained the public meeting schedule, handouts, notes, and PowerPoint presentations from the meetings. The Draft Plan page contained sections from the draft plan for review. The References page contained the 2007 Montana Tech PDM Plan, the 2010 Butte-Silver Bow County Hazard Mitigation Plan, and FEMA guidance on preparing Disaster Resistant University Plans. The Forms page contained a document review comment form and cost-share tracking form. Each page of the website had a comment field where viewers could log in their issues or concerns. The project website will be available through adoption of the PDM Plan.

2.5 PUBLIC MEETINGS

Two public meetings were conducted during the plan update process: a project kick-off meeting where the original 2007 PDM Plan was reviewed and hazards identified, and a meeting to present the draft risk assessment and mitigation strategy. Sign-in sheets, presentation materials and meeting notes are presented in **Appendix B** and posted on the project website.

A project kick-off meeting was held on April 4, 2013 on the Montana Tech campus in Butte. The meeting was advertised by sending an e-mail notice to the PDM Advisory Committee members, project stakeholders, and Montana Tech faculty, staff, and students. The meeting notice was also posted on the project website. Tetra Tech made a presentation at the meeting which reviewed each section of the 2007 PDM plan, outlined the background and rationale for updating the plan, the process and methodology for the plan update, and the project schedule. The meeting presentation was placed on the project website for stakeholders who could not attend the meeting. Approximately 23 individuals participated in the meeting including representatives from a number of university departments, Butte-Silver Bow County, NorthWestern Energy, and St. James Healthcare.

A second public meeting was held on November 7, 2013 to review the draft risk assessment and mitigation strategy. The meeting was held on the Montana Tech campus in Butte. Notice of the meeting was e-mailed to the PDM Advisory Committee, project stakeholders, Montana Tech faculty, staff, and students, and posted on the project website. Approximately 18 individuals attended the public meeting including Montana Tech Advisory Committee members and staff from both the north campus and Highlands College, the Butte-Silver Bow Sheriff, and representatives from NorthWestern Energy and St. James Healthcare. Public meeting attendees networked before and after the meeting, listened to the presentation, asked questions, participated in discussion, and offered comments on the draft plan.

2.6 MONTANA TECH PREPAREDNESS SURVEY

A preparedness survey was developed to solicit input from campus faculty, students, and staff. The survey was also provided in electronic format on the project website with an all-campus e-mail announcing its availability. As a way of creating interest, individuals who completed the survey were entered into a drawing for gift certificates to the campus bookstore. The survey was open for approximately four weeks.

The survey included 12 questions concerning individual preparedness including one question on which hazards participants were most concerned about. One question also referred review of the draft PDM Plan with a link to the document. A copy of the survey results is presented in **Appendix B**, and is summarized below.

- Over 387 survey responses were collected.

- 71 percent of the survey participants were students, 15 percent were staff, 11 percent faculty, and 3 percent were from the Montana Bureau of Mines and Geology.

- When asked which hazards concerned them most, survey participants indicated the following:
  - ✓ Fire (household, school building, lab fire) – 29 percent
  - ✓ Severe weather (wind, thunderstorm, winter storm) – 27 percent
  - ✓ Earthquake – 17 percent
  - ✓ Hazardous Material Release or Spill – 16 percent

- Regarding the Montana Tech PDM Plan, 49 percent of the survey participants said they didn't look at it, 36 percent said they spent 15 minutes on it, 11 percent spent 30 minutes looking it over, and 3 percent said they spent over 60 minutes reviewing the document.

2.7 PLAN REVIEW

University faculty, staff, and students and the public were provided at least two opportunities for comment on the draft plan prior to adoption. The first opportunity was during the drafting process. A notice was published in the campus and local newspapers announcing the availability of the draft PDM Plan in hard copy, electronically on compact disk upon request, or via the project website with directions on how to comment. A hard copy of the PDM Plan was available for review in the Montana Tech Environmental Health and Safety office. An e-mail announcement was also sent to the project stakeholders announcing the availability of the draft PDM Plan for review.

The draft document was produced with line numbers to aid in the review process. Reviewers were asked to submit their comments on the draft plan to the Montana Tech Environmental Health and Safety office or via the project website after a 30-day review period. The chairman of the Advisory Committee reviewed the comments and in consultation with the Advisory Committee submitted a consolidated list of comments to the contractor. Comments were incorporated into a revised draft document and the PDM Plan was submitted to the State Hazard Mitigation Officer (SHMO) and FEMA for compliance with the Region 8 Crosswalk.

Comments received from the SHMO and FEMA were addressed and the revised draft plan was produced and posted on the project website. At this point a second opportunity was provided to faculty, staff, and students and the public to comment on the PDM Plan. The revised draft plan was posted on the project website and stakeholders were notified of its availability via an e-mail. Any additional comments were addressed and the final plan was posted on the project website and provided to the Chancellor of Montana Tech for adoption. After adoption, final copies of the plan were submitted to the Montana Tech, the Montana SHMO and FEMA.

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3.0 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.

3.1 CAMPUS OVERVIEW

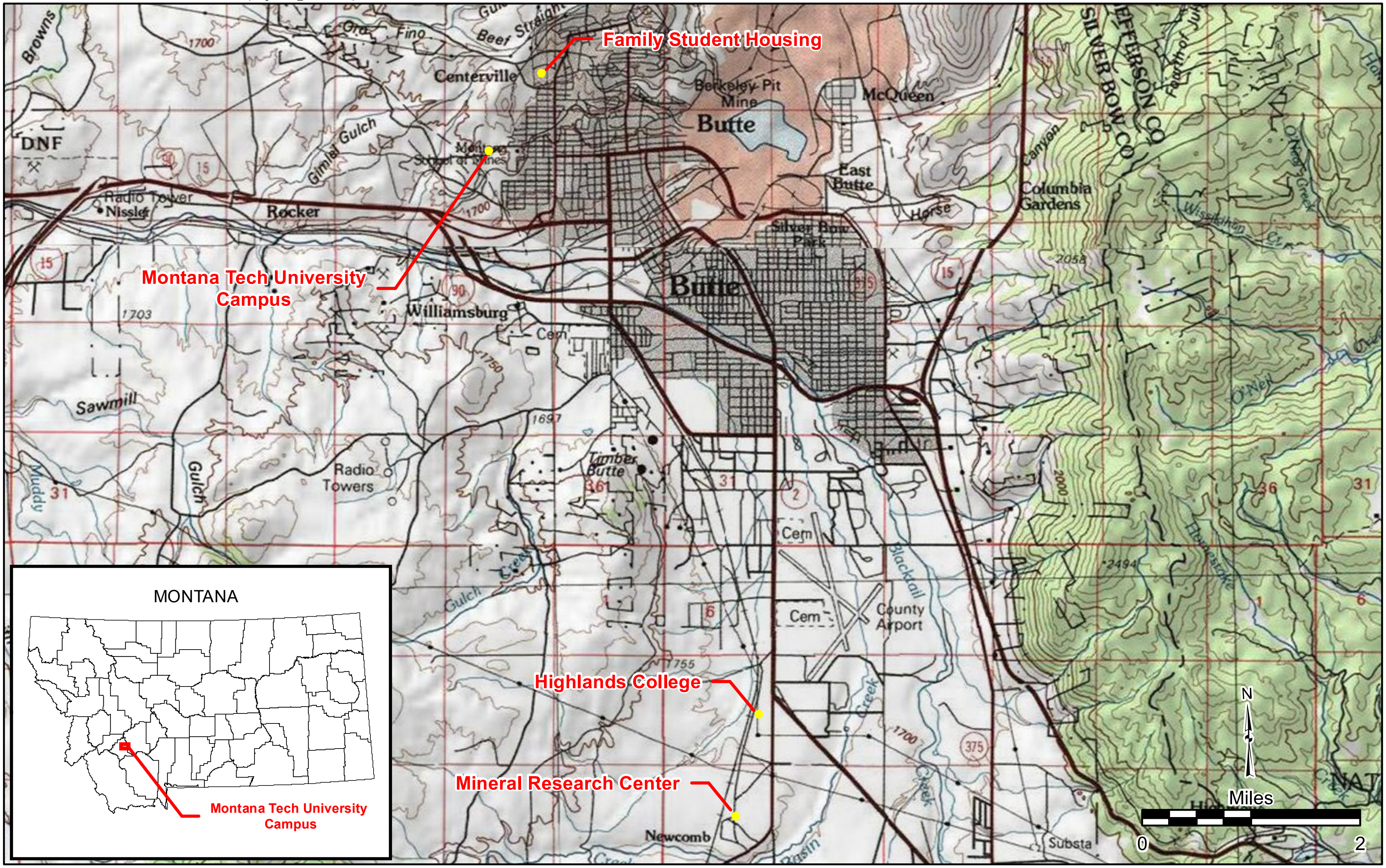
Founded in 1890, Montana Tech is a four-year public institution located in the northwest section of up-town Butte, in Silver Bow County, Montana (**Figure 3-1**). Originally called the Montana State School of Mines, the name was changed in 1965 to the Montana College of Mineral Science and Technology. In 1994, the college became affiliated with the University of Montana and the name officially changed to Montana Tech of The University of Montana. Montana Tech's North Campus is located in uptown Butte, at 1300 W. Park Street, and contains 79 acres. There are approximately 30 structures (**Figure 3-2**) on the North Campus; 11 are academic buildings containing 37 lecture classrooms, 25 computer labs, and 21 specialty labs. Apartment housing is located 1.2 miles northeast of the North Campus and is situated on about 15 acres. The Montana Tech North Campus has a student body of approximately 2,700 students.

Highlands College of Montana Tech, formerly known as the College of Technology, is located at 25 Basin Creek Road approximately seven miles southeast of the North Campus (**Figure 3-1**). Highlands College currently serves a student population of 786. The facility consists of one building with nearly 60,000 square feet of classroom and laboratory space and a total of 96,000 square feet overall, the new Allied Trades building, and a garage, all on about 41 acres of land (**Figure 3-2**). Highlands College contains 10 lecture classrooms, 8 computer labs and 9 specialty labs.

The Minerals Research Center, located in the Industrial Park south of the airport (**Figure 3-1**) on South Parkmont Drive, is approximately 1 mile south of the Highlands College. This facility consists of five buildings located on 11.3 acres (**Figure 3-2**). Two buildings are high bay structures of 3,200 square feet each. In addition, there are two single story buildings – a shop and warehouse building of 3,200 square feet and a laboratory building of 6,400 square feet. These building are currently not used by Montana Tech and are leased to others.

Montana Tech is headed by a Chancellor, Vice Chancellor for Academic Affairs/Provost, Vice Chancellor for Administration & Finance, Vice Chancellor for Development and University Relations, Vice Chancellor for Research and Associate, and Vice Chancellor Student Affairs/Dean of Students. The Faculty Senate provides representation for the faculty. The Associated Students of Montana Tech provide the student government.

N:\PROJECTS\Montana Tech\2013 PDM Plan\GIS\ArcMap\Figure3-1_LocationMap.mxd



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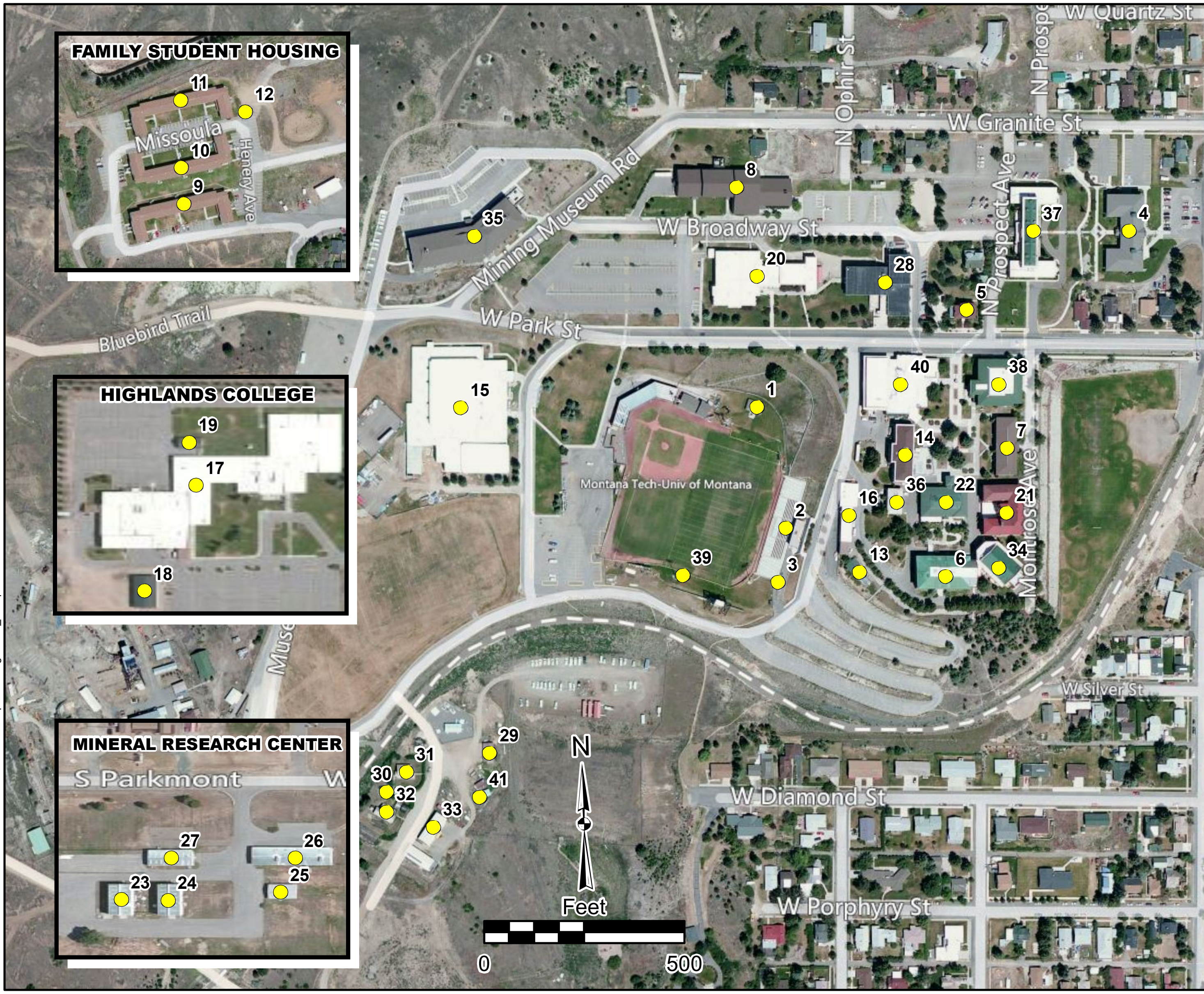
Location Map

Montana Tech of the University of Montana - Butte, Montana

Pre-Disaster Mitigation Plan

Figure 3-1



ID	Name
1	Alumni Coliseum Pavilion
2	Alumni Coliseum Pressbox & Bleachers
3	Alumni Coliseum Ticket Booths
4	Centennial Hall (Student Residence-East)
5	Chancellor's Residence-H
6	Chemistry - Biology Building (CBB) - H
7	Engineering Hall-H
8	Engineering Laboratory-Classroom Building
9	Family Student Housing - Lexington Apartment
10	Family Student Housing - Missoula Apartment
11	Family Student Housing - Missoula Apartment
12	Family Student Housing - Storage Shed
13	Greenhouse
14	Health Sciences Building
15	Health, Physical Education, and Recreation
16	Heating Plant Building
17	Highlands College
18	Highlands College - Allied Trades Building
19	Highlands College - Garage
20	Library Building & Auditorium Building
21	Main Hall-H
22	Mill Building-H
23	Mineral Research Center - Pilot Plant I
24	Mineral Research Center - Pilot Plant II
25	Mineral Research Center Office Building
26	Mineral Research Ctr Office & Lab Building
27	Mineral Research Ctr Warehouse & Shop
28	Mining Geology Building (M&G)
29	Motor Pool Garage & Shed
30	MT Tech Offices - Garage - H.I.R.L.
31	MT Tech Offices - North Bldg - H.I.R.L.
32	MT Tech Offices - South Bldg - H.I.R.L.
33	MT Tech/MBMG Storage Building
34	Museum Building-H
35	Natural Resources Building
36	Physical Plant Building
37	Prospector Hall (Student Residence-West)
38	Science & Engineering Building (S&E)-H
39	Scoreboard and Video Display
40	Student Union Building
41	Welding & Concrete Shop

N:\PROJECTS\Montana Tech\2013 PDM Plan\GIS\ArcMap\NEW\Figure3-2_CampusDetail.mxd

Legend: ● Montana Tech University Campus

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Campus Detail

Montana Tech of the University of Montana - Butte, Montana

Pre-Disaster Mitigation Plan

Figure 3-2

Montana Tech offers 6 certificates, 9 associates, 19 bachelors, 11 masters, and a PhD program. Research on campus involves over 100 ongoing programs with years of vested time and values in excess of $15,000,000. Undergraduates, graduates, faculty and staff actively participate in campus research funded by a variety of extramural sources. In addition, the campus maintains three research units with specific charters. These include:

- Center for Advanced Mineral and Metallurgical Process
- Montana Bureau of Mines and Geology
- Center for Environmental Remediation and Assessment

The Montana Bureau of Mines and Geology (MBMG) is a Montana state agency located on campus and maintains the only seismic monitoring network in the state. Research on campus is addressed further in *Section 3.7.2.*

3.2 CAMPUS POPULATIONS

Approximately 2,100 full time equivalent students attend classes on the Montana Tech campus every semester. Montana Tech's enrollment has increased consistently over the years. In-state students account for 87 percent of the students and 13 percent of students are from out-of-state. Students in 2013 come from 43 different states and 13 foreign countries. Often, out-of-state students are unfamiliar with the community and the possible hazards that can occur.

Montana Tech has 2,537 full-time equivalent employees; 2,134 on the north campus and 402 at the Highlands College. In addition, Montana Tech has up to 600 part-time student employees. Each college is headed by a dean. Administrative officers head up non-academic departments on campus.

Fall semester generally begins the third week in August 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 last week in May and ends during the first week in August. Summer session is divided into two five week sessions.

Populations on campus are dynamic. Occupancy in buildings and residence halls vary based on the time of day and day of the week, and vary from semester to semester. Most students are on the campus between the hours of 8:00 am and 5:00 pm. Large lecture halls are located in the Mining/Geology Building, Chemistry/Biology Building, Health Sciences Building, Science and Engineering, Engineering Lab and Classroom Building, Natural Resources Building, and the Library auditorium. Daytime populations are distributed throughout all buildings. Night classes are between 5:00 pm and 10:00 pm and have lower attendance than day classes.

Faculty and staff are dispersed in various buildings around campus and generally have offices within their own departments. Administration staff is generally located in the Mining/Geology Building.

Visitors come to tour the campus, visit students, visit the MBMG, and attend various cultural and athletic activities on campus. 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 Section *3.7.5*.

The majority (86 percent) of Montana Tech's population resides off campus in non-university housing. Montana Tech provides on campus housing for approximately 300 students. Centennial Hall is a three story residence hall that houses up to 94 students in 64 rooms. Prospector Hall is a four story residence hall that houses up to 186 students in 116 rooms. Students of all ages reside in the residence halls, however, most students living in the residence halls are freshman. Unless the student is able to live with immediate family within 30 miles of the campus, all freshmen under the age of 21 are required to live in residence halls. Family Student Housing consists of 60 two and three-bedroom apartments located approximately one mile from campus. There is no campus housing associated with the Highlands College. Enrolled students are welcome to live in the Montana Tech residence halls (which are four miles away) but there is no requirement that freshmen do so.

3.3 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. Montana Tech is an important contributor to the economy of Butte-Silver Bow 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 Montana Tech's ability to function or provide services would have a significant impact on Butte 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. Montana Tech's total economic contribution to the state economy in 2004 was estimated at $27,229,326. A more recent analysis was not available.

3.4 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.

3.4.1 Campus Buildings

The main Montana Tech campus consists of the Natural Resources Building, Science/Engineering Building, Engineering Hall, Main Hall, the Chemistry/Biology Building, the Health Sciences Building, the Mining/Geology Building, the Health, Physical Education and Recreation (HPER) Complex, Auditorium, the Museum Building, the Mill Building computer lab and the Engineering Lab and Classroom Building, all of which are used for classes. Support facilities for the academic programs include the Library and greenhouse. Auxiliary service facilities include the Residence Halls, the Student Union Building, Mill Building, and off-campus apartments. The Chancellor's Residence, a stately brick home, is also on campus. In addition to the buildings, Alumni Coliseum hosts football and other sports events. The campus also has four smaller sports fields.

The Highlands College consists of one building with 10 lecture classrooms, 8 computer labs and 9 specialty labs, the Allied Trades building, and a garage. The Mineral Research Center consists of five buildings; two high bay structures, a shop, warehouse, and laboratory 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 Risk Management and Tort Defense Division, and was verified by campus personnel. Tier 1 building assessments, assessing earthquake vulnerability, were completed for 13 buildings at Montana Tech in 2010 and 2011, including the building comprising the Highlands College.

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.

FEMA Tier 1 Seismic evaluations were conducted on 11 buildings on the Montana Tech and Highlands College campuses. A summary of the Tier 1 evaluation is contained in **Appendix C** with further discussion in *Section 4.7*.

3.4.2 Building Characteristics

Building age, quality of construction, size and construction materials are indicators of how well a building can withstand a disaster. **Table 3.4-1** summarizes the characteristics of campus buildings. **Figures 3-3 and 3-4** display the construction material type and building age for the Montana Tech campus, respectively. **Appendix C** contains photos of most campus buildings with detailed characteristics and insurance details.

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. Unreinforced masonry buildings on the Montana Tech campus include Main Hall and Engineering Hall.

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 where:

- 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 3.4-1 identifies the hazardous material risk associated with each building on the Montana Tech campuses.

Buildings that contain sprinkler systems include the Centennial Residence Hall, Prospector Residence Hall, the Mill Building, the Engineering Lab/Classroom Building, the stage portion of the Library Auditorium, Family Student Housing, and the Highlands College. However, all campus buildings have fire alarm systems and evacuation maps showing a primary and secondary route to exit. In some cases, it is an exterior fire escape. Three designated assembly areas exist for the North Campus; the HPER parking lot (west side of football stadium), Natural Resources Building (far west parking lot), and the Leonard Field (east of campus). Assembly areas for the Highlands College include the north and south ends of the building's parking lot.

TABLE 3.4-1
MONTANA TECH BUILDING CHARACTERISTICS

No.	Name	Fire Sprinklers (yes/no)	Seismic Retrofit (yes/no)	Backup Power (yes/no)	Haz Mat Risk (LMH)	Maximum Occupancy (# students/ residents)	Year Built	Square Feet	Building Value	Content Value	Construction Class	Historical Building
1	Alumni Coliseum Pavilion	N	N	N	L	50	1993	925	$8,243	-	D	N
2	Alumni Coliseum Press Box & Bleachers	N	N	N	L	3,000	1965	17,587	$1,281,843	$682,120	D	N
3	Alumni Coliseum Ticket Booths	N	N	N	L	2	1990	89	$7,952	$2,171	C	N
4	Centennial Residence Hall	Y	N	N	L	94	2000	33,879	$4,385,445	$992,557	C	N
5	Chancellor's Residence-H	N	N	N	L	2	1936	5,077	$973,474	$31,555	D	N
6	Chemistry - Biology Building	N	Y	N	H	305	1921	44,966	$9,542,746	$3,087,782	B	Y
7	Engineering Hall-H	N	Y	N	L	85	1923	13,413	$2,886,365	$856,434	I	Y
8	Engineering Lab/Classroom Building	Y	N	N	H	360	1984	60,779	$12,671,319	$3,196,471	B	N
9	Family Student Housing - Lexington Apartments	Y	N	N	L	40	1950	20,309	$2,183,712	-	D	N
10	Family Student Housing - Missoula Apartments N.	Y	N	N	L	40	1950	20,309	$2,183,712	-	D	N
11	Family Student Housing - Missoula Apartments S.	Y	N	N	L	40	1950	20,309	$2,183,712	-	D	N
12	Family Student Housing - Storage Shed	N	N	N	M	0	1950	100	$4,000	-	U	N
13	Greenhouse	N	N	N	M	1	2012	1,596	$37,038	$50,000	C	N
14	Health Sciences Building	N	N	N	L	209	1953	21,946	3,792,200	3,810,670	B	N
15	Health, Physical Education, & Recreation Building	N	N	N	L	124	1980	86,132	$11,650,616	$784,926	B	N
16	Heating Plant Building	N	N	N	H	8	1969	11,037	$1,176,551	$372,760	B	N
17	Highlands College	Y	N	N	H	511	1983	93,807	$14,207,290	$6,707,850	C	N
18	Highlands College - Allied Trades Building	N	NA	N	L	45	2009	5,000	$350,000	unknown	C	N
19	Highlands College Garage	N	N	N	M	0	2007	1,536	$57,805	$37,992	D	N
20	Library Building & Auditorium Bldg (joined)	Y	N	N	L	220	1977	39,297	$6,922,570	$62,916,260	C	N
21	Main Hall-H	N	N	N	H	300	1896	38,083	$8,312,108	$2,574,802	I	Y
22	Mill Building-H	Y	Y	N	L	50	1908	16,813	$3,611,583	$161,820	C	Y

TABLE 3.4-1
MONTANA TECH BUILDING CHARACTERISTICS

No.	Name	Fire Sprinklers (yes/no)	Seismic Retrofit (yes/no)	Backup Power (yes/no)	Haz Mat Risk (LMH)	Maximum Occupancy (# students/ residents)	Year Built	Square Feet	Building Value	Content Value	Construction Class	Historical Building
23	Mineral Research Center - Pilot Plant I	N	N	N	L	0	1972	3,200	$175,833	$12,781	F	N
24	Mineral Research Center - Pilot Plant II	N	N	N	L	0	1972	3,200	$187,861	$5,725	F	N
25	Mineral Research Center Office Building	N	N	N	L	0	1972	3,158	$141,077	$38,522	D	N
26	Mineral Research Center Office & Lab Building	N	N	N	L	0	1972	5,740	$775,958	-	A	N
27	Mineral Research Center Warehouse & Shop Bldg	N	N	N	L	0	1972	3,200	$285,910	$78,070	E	N
28	Mining Geology Building (M-G)	N	N	N	M	375	1972	42,236	$7,146,020	$1,977,675	B	N
29	Motor Pool Garage & Shed	N	N	N	M	0	unknown	1,481	$61,916	-	D	N
30	MT Tech/MBMG Storage Building	N	N	N	L-M	0	1994	2,400	$93,848	$48,084	A	N
31	MT Tech Offices - Garage - H.I.R.L. Program	N	N	N	L	0	1938	440	$18,395	-	D	N
32	MT Tech Offices - North Bldg - H.I.R.L Program	N	N	N	L	0	1938	1,065	$107,599	$15,961	D	N
33	MT Tech Offices - South Bldg -H.I.R.L. Program	N	N	N	M	0	1938	1,065	$107,599	$15,961	U	N
34	Museum Building-H	N	N	N	L	100	1939	36,394	$7,592,469	$778,275	C	Y
35	Natural Resources Building	Y	NA	Partial	H	365	2009	59,967	$18,174,300	$1,300,770	B	N
36	Physical Plant Building	N	N	Y	H	12	1948	6,300	$246,353	$126,220	C	N
37	Prospector Hall-H	Y	N	N	L	186	1935	53,911	$6,100,753	$396,293	B	Y
38	Science & Engineering Building (S&E)-H	N	N	N	H	325	1925	34,996	$6,412,038	$2,320,516	B	Y
39	Stadium Scoreboard &Video Screen	N	NA	N	L	-	2011	-	$500,000	-	-	N
40	Student Union Building	N	N	N	L	125	1960	45,015	$8,084,464	$1,347,581	B	N
41	Welding & Concrete Shop	N	N	N	H	0	1997	2,000	$232,070	$206,073	A	N

TABLE 3.4-1
MONTANA TECH BUILDING CHARACTERISTICS

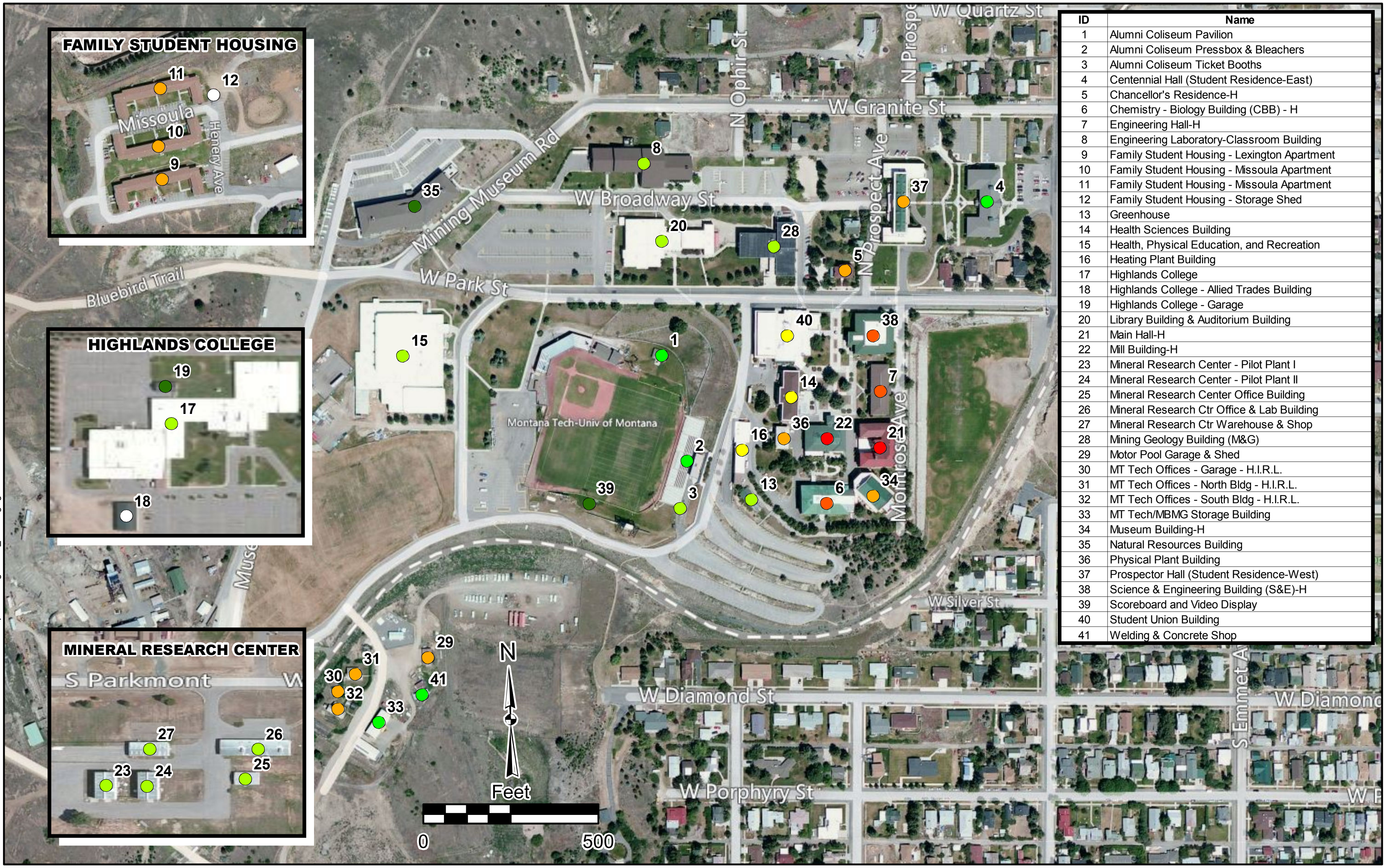
No.	Name	Fire Sprinklers (yes/no)	Seismic Retrofit (yes/no)	Backup Power (yes/no)	Haz Mat Risk (LMH)	Maximum Occupancy (# students/ residents)	Year Built	Square Feet	Building Value	Content Value	Construction Class	Historical Building

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, I – Unreinforced masonry, 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 3-5*** 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. Economic damages associated with building content include but are not limited to books, technical instruments, research equipment, art, specimens, and furniture. ***Figure 3-6*** shows Content Values.



ID	Name
1	Alumni Coliseum Pavilion
2	Alumni Coliseum Pressbox & Bleachers
3	Alumni Coliseum Ticket Booths
4	Centennial Hall (Student Residence-East)
5	Chancellor's Residence-H
6	Chemistry - Biology Building (CBB) - H
7	Engineering Hall-H
8	Engineering Laboratory-Classroom Building
9	Family Student Housing - Lexington Apartment
10	Family Student Housing - Missoula Apartment
11	Family Student Housing - Missoula Apartment
12	Family Student Housing - Storage Shed
13	Greenhouse
14	Health Sciences Building
15	Health, Physical Education, and Recreation
16	Heating Plant Building
17	Highlands College
18	Highlands College - Allied Trades Building
19	Highlands College - Garage
20	Library Building & Auditorium Building
21	Main Hall-H
22	Mill Building-H
23	Mineral Research Center - Pilot Plant I
24	Mineral Research Center - Pilot Plant II
25	Mineral Research Center Office Building
26	Mineral Research Ctr Office & Lab Building
27	Mineral Research Ctr Warehouse & Shop
28	Mining Geology Building (M&G)
29	Motor Pool Garage & Shed
30	MT Tech Offices - Garage - H.I.R.L.
31	MT Tech Offices - North Bldg - H.I.R.L.
32	MT Tech Offices - South Bldg - H.I.R.L.
33	MT Tech/MBMG Storage Building
34	Museum Building-H
35	Natural Resources Building
36	Physical Plant Building
37	Prospector Hall (Student Residence-West)
38	Science & Engineering Building (S&E)-H
39	Scoreboard and Video Display
40	Student Union Building
41	Welding & Concrete Shop

Building Age

Unknown	
1880 - 1910	
1911 - 1930	
1931 - 1950	
1951 - 1970	
1971 - 1990	
1991 - 2000	
2001 - 2012	

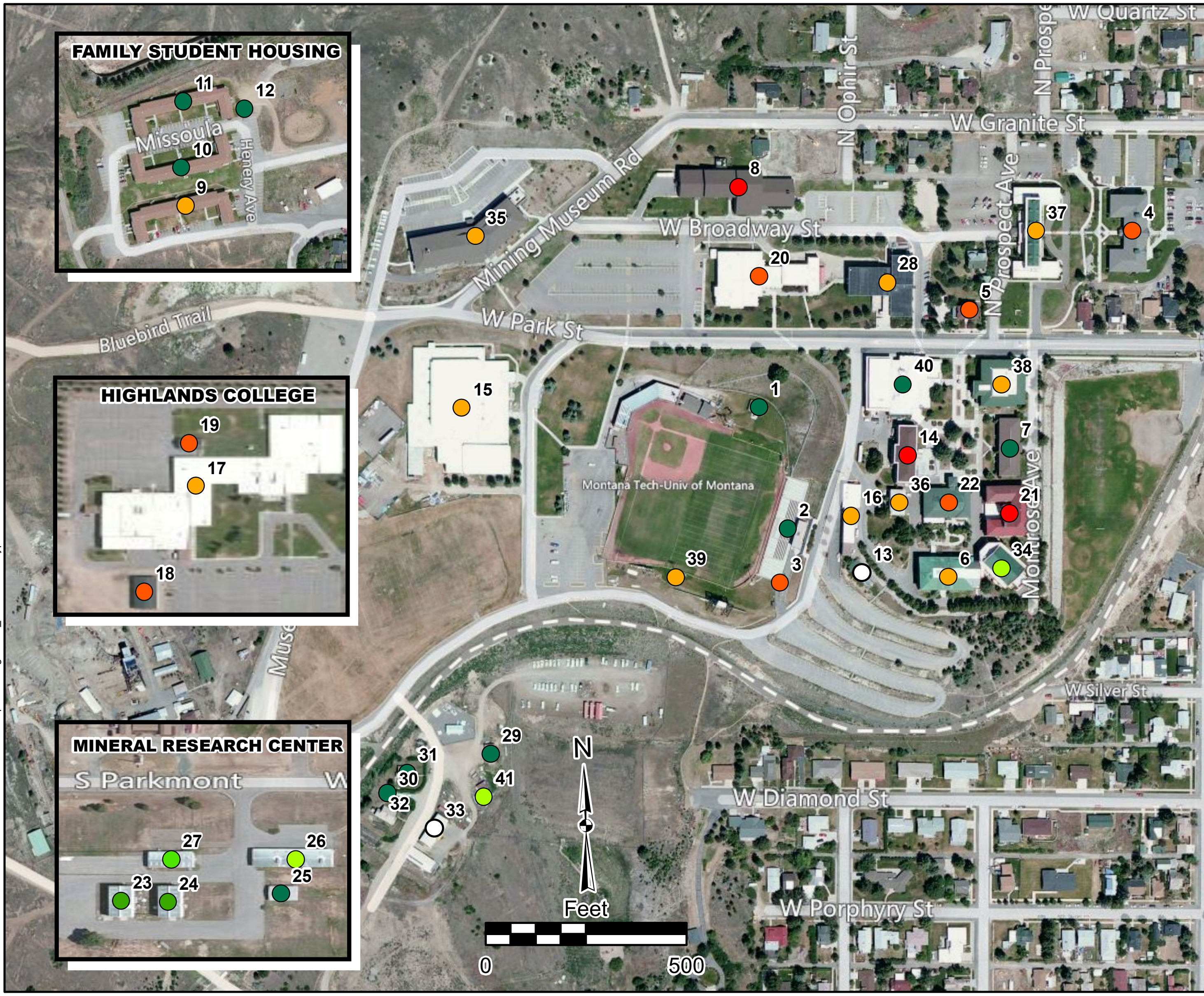
AUGUST 2013

Building Age

Montana Tech of the University of Montana - Butte, Montana

Pre-Disaster Mitigation Plan

Figure 3-3



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33	MT Tech/MBMG Storage Building
34	Museum Building-H
35	Natural Resources Building
36	Physical Plant Building
37	Prospector Hall (Student Residence-West)
38	Science & Engineering Building (S&E)-H
39	Scoreboard and Video Display
40	Student Union Building
41	Welding & Concrete Shop

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Construction Type

- Unknown
- Unreinforced concrete frame
- Unprotected steel frame with non-combustible (masonry) exterior
- Reinforced concrete frame
- Precast frame
- Fire-protected steel frame
- Steel frame with combustible exterior walls
- Steel stud
- Wood frame

AUGUST 2013

Construction Type

Montana Tech of the University of Montana - Butte, Montana

Pre-Disaster Mitigation Plan

Figure 3-4

3.4.3 *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.

Butte-Silver Bow Fire Department

Montana Tech is dependent on the Butte/Silver Bow Fire Department for Emergency Services. Butte, has seven fire stations within its city limits. Nearby Walkerville has one fire station which is 0.62 miles from the Montana Tech campus. The closest fire station to the Highlands College campus is the Bert Mooney Airport station located 2.3 miles to the north.

Butte-Silver Bow Law Enforcement

Montana Tech relies on the services of Butte-Silver Bow Law Enforcement for services above and beyond what campus police provide. The city-county law enforcement facility is located 1.11 miles from the main Montana Tech campus and 7.3 miles from the Highlands College campus.

St. James Healthcare (Hospital)

St. James Healthcare is a hospital located at 400 South Clark Street in Butte. St. James Healthcare is 1.14 miles from main Montana Tech campus and 7.3 miles from the Highlands College campus. It is a 100-bed facility staffed by 600 employees. St. James offers specialized services in cardiology, oncology, orthopedics, neurosciences, and women's and children's services. The Emergency Department is open 24-hours per day, 7-days per week and treats between 1,000-1,200 individuals each month. The Emergency Room has two new trauma rooms with new equipment and state-of-the-art monitors, family consultation room, triage room, decontamination room, and radiographic room.

3.5 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.

3.5.1 Underground Tunnels

Underground tunnels connect the Chemistry/Biology Building, Mineral Museum, Main Hall, Engineering Building, Engineering/Science Building and Prospector Hall. Another tunnel system connects the Heating Plant with the Mining/Geology Building. Utilities located in tunnels include telephone, water, fiber optic cables, and steam lines. Electrical and natural gas lines are located in some of the tunnels. The non-reinforced tunnels are vulnerable to earthquakes. Fire alarms do go off in the tunnels but can't be heard if just going off in building above. Students, faculty and staff use portions of the tunnel system to get between buildings.

3.5.2 Central Heating

The central heating plant, providing steam heat to the North Campus except for the Centennial Residence Hall, is located in the Heating Plant building. The new Natural Resources building is connected to the central heating plant but the piping is direct buried and not in a tunnel. In 1999-2000, the heating plant was updated with: a new boiler; new burners and controllers were added to the two existing boilers; a new condensate return pumping system; and, a backup generator. Steam from the plant goes either through pipes in the underground tunnels or buried piping.

The Highlands College has a gas-fired boiler and heat is provided to the building via hydronic heating loops.

3.5.3 Electricity and Natural Gas

Electricity and natural gas are provided by NorthWestern Energy. Electrical lines enter the North Campus at one location on the east side of the campus on Park Street. Power lines are above ground until they enter the campus then they are underground. Power outages are frequent and there is no redundancy in the electrical feed to the campus. Power outages can occur on campus if damage occurs to above ground power lines or poles in Butte. Power outages have been caused by heavy snow, ice storms, car accidents, broken tree limbs and high winds. Earthquakes also have the potential to down power lines.

Natural gas lines go into the HPER, Engineering Lab and Classroom Building, Chemistry/Biology Building, Mill Building, and Natural Resource Building. There is a master shut off valve to stop all gas flow in lines entering the campus. All natural gas lines on campus are non-flexible lines which are vulnerable to breakage during earthquakes. The Highlands College buildings also have a natural gas service shut-off valve.

3.5.4 *Information Systems, Telephone, Communications and Internet*

The Data Center is located on the first floor of the Mining Geology Building in Room 106. The data center has automatic fire suppression and automatic notification to Physical Facilities. There is currently no redundancy for critical capabilities related to emergency response provided by the data network; however, Montana Tech is working with UM-Missoula to develop a system for virtual backups for disaster recovery purposes. The Student Information System is backed up on a regular schedule. All core servers are backed up weekly. UM-Missoula backs up the Human Resources and Finances systems. E-mail is backed up daily. It is up to the faculty and staff's discretion to back up their individual computer files. There is no protocol for off-site storage of backup tapes; however, a system for virtual information exchange is being developed.

Highlands College is also served by the Data Center at the North Campus. Currently, a fire suppression upgrade is underway which will have an automatic notification system to Physical Facilities. There is currently no network system at the Mineral Research Center.

The Banner System is a centralized administrative data management system based at UM-Missoula. This commercially developed computer application is used to administer campus operations for the entire Montana University System. UM-Missoula maintains backups for the Banner System.

Computer labs at the Montana Tech are located in the following buildings: Science and Engineering, Engineering, Museum, Chemistry Biology, Student Union, Mining Geology, Library, Engineering Lab and Classroom, Natural Resources, Health Sciences, Mill, Centennial Hall, Prospector Hall and at the Highlands College.

Telephone systems are centralized in Centennial Hall. The telephone switch is battery powered and a generator is in place as backup if commercial power fails. In the event of a failure, staff would be notified in a timely manner. Gasoline for the generator is stored on the premises. The telephone switch has a totally redundant processor that takes over if the initial processor fails. All the facilities have battery back-up until the point where they interface with Network Services. If the telephone switch fails completely there are a few city lines that are independent of the switch and can be used to communicate with the outside. Two-way radio facilities are battery backed for use in a situation where all lines fail. The repeater for the radios is located at family housing. Montana Tech has a campus emergency vehicle that has adequate battery facilities to act as de-facto Incident Command Center and has access to all of the local frequencies. There are no longer payphones on campus.

The MBMG operates its own computer servers separately from the college as part of the centralized network. All of MBMG's digital databases are served from machines located in Natural Resources Building (NRB). MBMG maintains its websites and seismic data on servers located in NRB 204. MBMG servers are incrementally backed up each night with complete backups each week. Complete monthly backups are stored in a vault located in the Museum Building. A power backup is being developed for the MBMG computer room so their servers will continue to operate in the event of a power interruption to the Montana Tech campus.

3.5.5 Water and Sewer

Water and sewer services to the Montana Tech North Campus, Highlands College, and Mineral Research Center are provided by the City of Butte. The primary sources of water are the Big Hole River's South Fork Reservoir, Moulton Reservoir, and the Basin Creek Reservoir System. The Butte-Silver Bow Hazard Mitigation Plan lists the reservoirs, the treatment plants, Public Works Building, pump stations and water tanks as high priority critical facilities. The water lines and sewer system both on and off campus are vulnerable to earthquakes. Some of the water lines serving the North Campus are located in the unreinforced underground tunnels. A disruption in water services to the campus would cause loss of potable water, loss of sanitary services, loss of cooling to the data center and phone switch and loss of steam production from the heating plant in turn causing loss of heat. Students residing on campus would be at the greatest risk if the water system on campus was disrupted or comprised.

3.6 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.

3.6.1 Administrative Services and Campus Records

Administrative offices are primarily located in the Mining Geology Building. Administrative offices in the Mining Geology Building include the Chancellor's Office, Admissions Office, Business Office, Registrar's Office, Financial Aid and Budget and Human Services Office. Current administrative, academic and employment records are stored in the Mining Geology Building. Other historic records are stored in vaults in the Museum Building. Student's health records are maintained in the Student Health Center in the Student Union Building.

3.6.2 Environmental Health and Safety

The Environmental Health and Safety Office is responsible for ensuring safety of students, employees and property on campus by developing and maintaining safety manuals, Occupational Health and Safety Administration (OSHA) plans, emergency action plans, laboratory safety manuals, hazardous material plans, and bio-hazard plans. The office 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.

3.6.3 Montana Bureau of Mines and Geology Earthquake Studies

MBMG operates the Ground-Water Information Center (GWIC) database. The database has almost 11,000 registered users and services about 4,900 data sessions and 34,000 queries each month. About 60 percent of data sessions are invoked by water well drillers, real estate agents, engineering and consultant firms, and state agency employees. GWIC contains the only copy of Montana's water well logs and is relied upon statewide and nationally by anyone seeking these data. Disruption of GWIC services immediately impacts those who in the operation of their businesses seek quick and ready access to well-log data.

MBMG also operates DrillerWeb (DW). DW is an online interface through which water well drillers file well completion logs. Submitting the log through DW completes the water-well contractor's statutory obligation to Montana to file a completion report for the work. Currently more than 60 water-well contractors file between 1,500 and 2,000 new water-well logs annually through the DW interface. Water-well contractors rely on access to DW to complete their obligation to the state and to their customers. Any lengthy disruption of DW services would have economic impact statewide to the water-well drilling industry.

MBMG is home to the only Earthquake Studies Office in the state of Montana, the recording facility for the Montana Regional Seismograph Network. No other facility in the state has the staff or equipment necessary to study and constantly monitor seismic activity. Located on the third floor of the Natural Resources Building on the Montana Tech campus, the Earthquake Studies Office has stations set up around Montana to monitor seismic activity. MBMG maintains a database of faults and historic seismic events in Montana.

3.6.4 Student Health Services

The Student Health Center, located on the lower level of the Student Union Building, provides a nurse on duty four hours a day, five days a week, and a physician on duty two hours a day, five days a week. Students registered for seven or more credits may visit the Health Center as often as they wish. The health center professionals do throat cultures, give allergy shots, offer health care counseling and are available to treat sprains, give and remove stitches, and tend to other health problems. Students from the Highlands College are eligible to use the Student Health Center if they pay the fee. They have to come to the North Campus to receive services. All health care matters and emergencies beyond what Student Health Services can provide are provided by St. James Healthcare as described in *Section 3.4.3*.

3.6.5 Campus Police/Security/Emergency Services

Campus police monitor and patrol the campus 24 hours a day, seven days a week and have an office in the Physical Plant. In 2007, Montana Tech had approximately 40 staff and faculty with Community Emergency Response Team (CERT) training; however, they have not received any updated training for a number of years. For situations that are above and beyond the abilities of campus police and trained personal, the University relies upon the Butte-Silver Bow County's Fire Department and Law Enforcement. Campus police go to the Highlands College a couple times a day, but don't provide the same level of service for Highlands as they do for the North Campus.

3.6.6 Shelters and Residence Halls

Montana Tech provides resident housing for approximately 300 Students. Centennial Hall, built in 2000, is a three story residence hall that houses up to 94 students in its 64 rooms. Prospector Hall was constructed in 1935 and is a four-story residence hall that houses up to 186 students in its 116 rooms. Family Student Housing consists of a total of 60 two- and three-bedroom apartments located approximately one mile from campus. There is no campus housing associated with the Highlands College.

The HPER complex is a shelter for relocating students from dorms and would be used if there was a disaster or pandemic quarantine. The American Red Cross has designated Centennial Hall, Prospector Hall and the HPER complex as shelters for the surrounding community. The Crest Nursing home has the campus designated as their shelter for temporary housing. Highlands College is not a Red Cross designated shelter, but depending on what the emergency is, students could be sheltered on-site. In addition, there is an arrangement with the adjoining youth facility to use the Highland College grounds and/or building in the event they have to evacuate. There are no shelters designated in the community for displaced campus residents. Loss of student housing during a disaster would require Montana Tech to find shelter for displaced students.

3.6.7 Physical Facilities

Physical Facilities maintains the infrastructure of the campus and is critical to the continuity of functions and services. Physical Facilities is also responsible for maintenance of the grounds and buildings. The Trades Crew Division of Physical Facilities provides services for maintaining architectural systems (doors, windows, ceilings, walls, etc), electrical services and systems; refrigeration/chilled systems; heating and ventilating systems; plumbing and steam distribution and campus utilities. The Grounds Crew Division of Physical Facilities maintains all campus roads, walkways, parking facilities, grounds, trees, and shrubbery. Other services that Physical Facilities is in charge of overseeing are solid waste collection and disposal, fire protection, security, and freight delivery service.

In the event of a hazard, Physical Facilities would ensure that the infrastructure of the campus was maintained. In the event of a severe storm or earthquake that left debris behind, Physical Facilities would be responsible for the cleanup. During severe winter events, Physical Facilities is in charge of snow removal on campus. Physical Facilities would be responsible for shutting down a building's heating, ventilation and air conditioning (HVAC) system in the event of a chemical, biological, or accidental toxic release. Physical Facilities is responsible for helping departments secure shelving and other important hazard mitigation activities.

3.7 SOCIAL AND ACADEMIC ASSETS

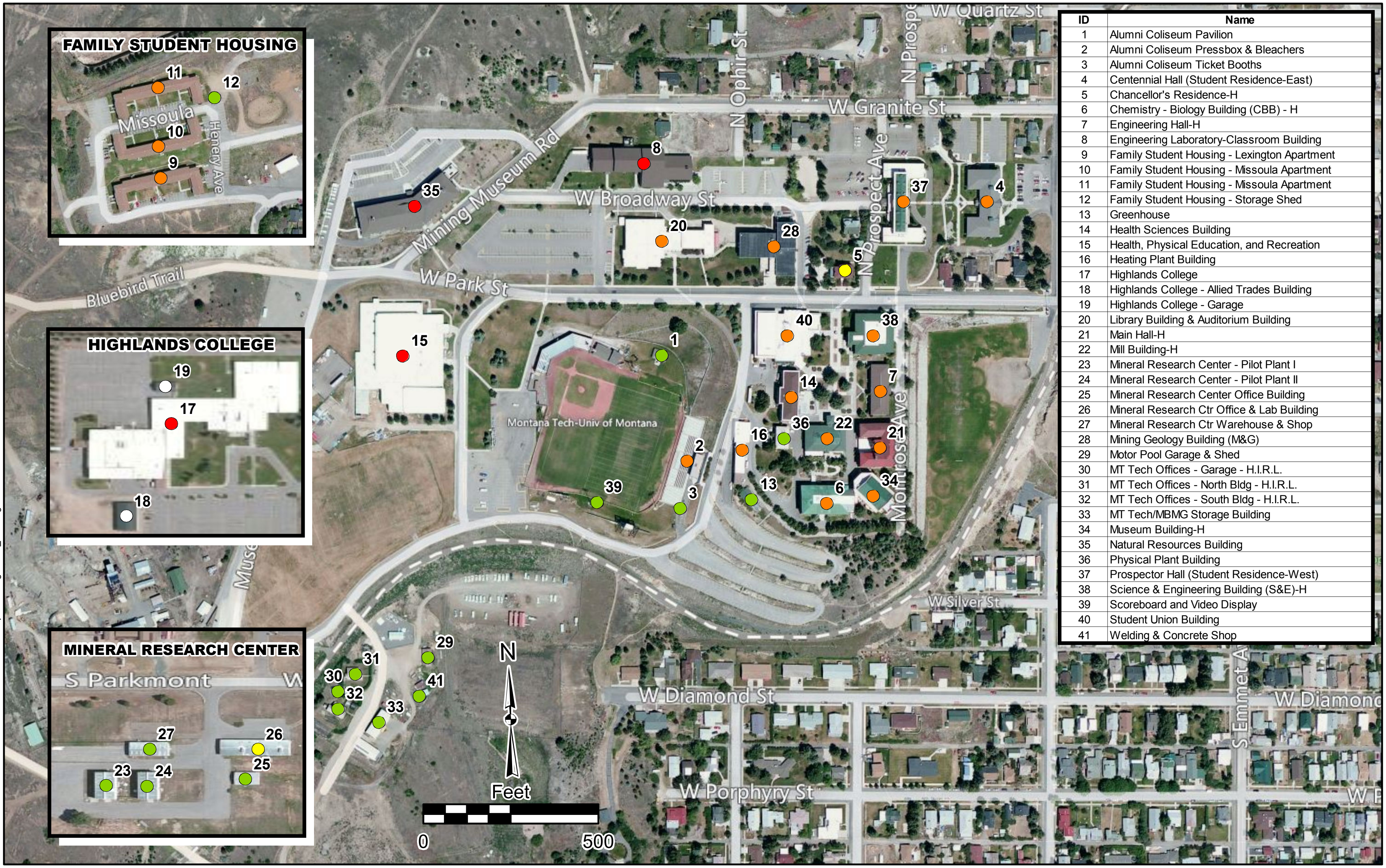
Academic, historic and cultural resources housed on campus are considered priority assets. The following section describes these campus resources. **Figures 3-5 and 3-6** depict building value and the value of building contents, respectively.

3.7.1 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. Montana Tech has several historic buildings on campus. Buildings older than 50 years qualify for the National Registry. Historical Buildings are listed in **Table 3.4-1**. The National Historic Landmarks Programs recognizes the community of Butte as a National Historic District. Montana Tech is within the Butte Historic District. Butte's distinctive landmarks, historical buildings, ethnic diversity and its role in national labor history all played a part in its historic recognition.

Main Hall was the first building on the Montana Tech campus. Construction started in 1896 and ended in 1900. Main hall has four floors, 38,083 square feet and its primary function is for classrooms and offices. On the front of the building are relief portraits of Benjamin Franklin for Physics, Thomas Hunt for Geology, Gaetzschmann for Mineralogy, John Percy for Metallurgy and Alexander Holly for Chemistry. Main Hall houses the Liberal Studies Department and the Electrical Engineering Department.

The Mill Building, constructed in 1908, the second building on the Montana Tech campus, was originally called the Metallurgical Building, and housed furnaces and machinery that students worked on for practical experience. Standing two stories high, the building has 16,812 square feet and serves as a student-oriented facility and a satellite operation to the Student Union with a game room, study areas, meeting rooms and the Coffee Mill. The Mill Building was originally designed as a lab facility, heating plant, dorm and storage house; it has been completely remodeled. The original boiler doors, saved from the remodeling, are mounted on the north wall by the main entrance.



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27	Mineral Research Ctr Warehouse & Shop
28	Mining Geology Building (M&G)
29	Motor Pool Garage & Shed
30	MT Tech Offices - Garage - H.I.R.L.
31	MT Tech Offices - North Bldg - H.I.R.L.
32	MT Tech Offices - South Bldg - H.I.R.L.
33	MT Tech/MBMG Storage Building
34	Museum Building-H
35	Natural Resources Building
36	Physical Plant Building
37	Prospector Hall (Student Residence-West)
38	Science & Engineering Building (S&E)-H
39	Scoreboard and Video Display
40	Student Union Building
41	Welding & Concrete Shop

N:\PROJECTS\Montana Tech\2013 PDM Plan\GIS\ArcMap\NEW\Figure3-5_BuildingValue.mxd

Building Value

Unknown	$0 - $500,000
$500,001 - $1,000,000	$1,000,001 - $10,000,000
$10,000,001 - $20,000,000	

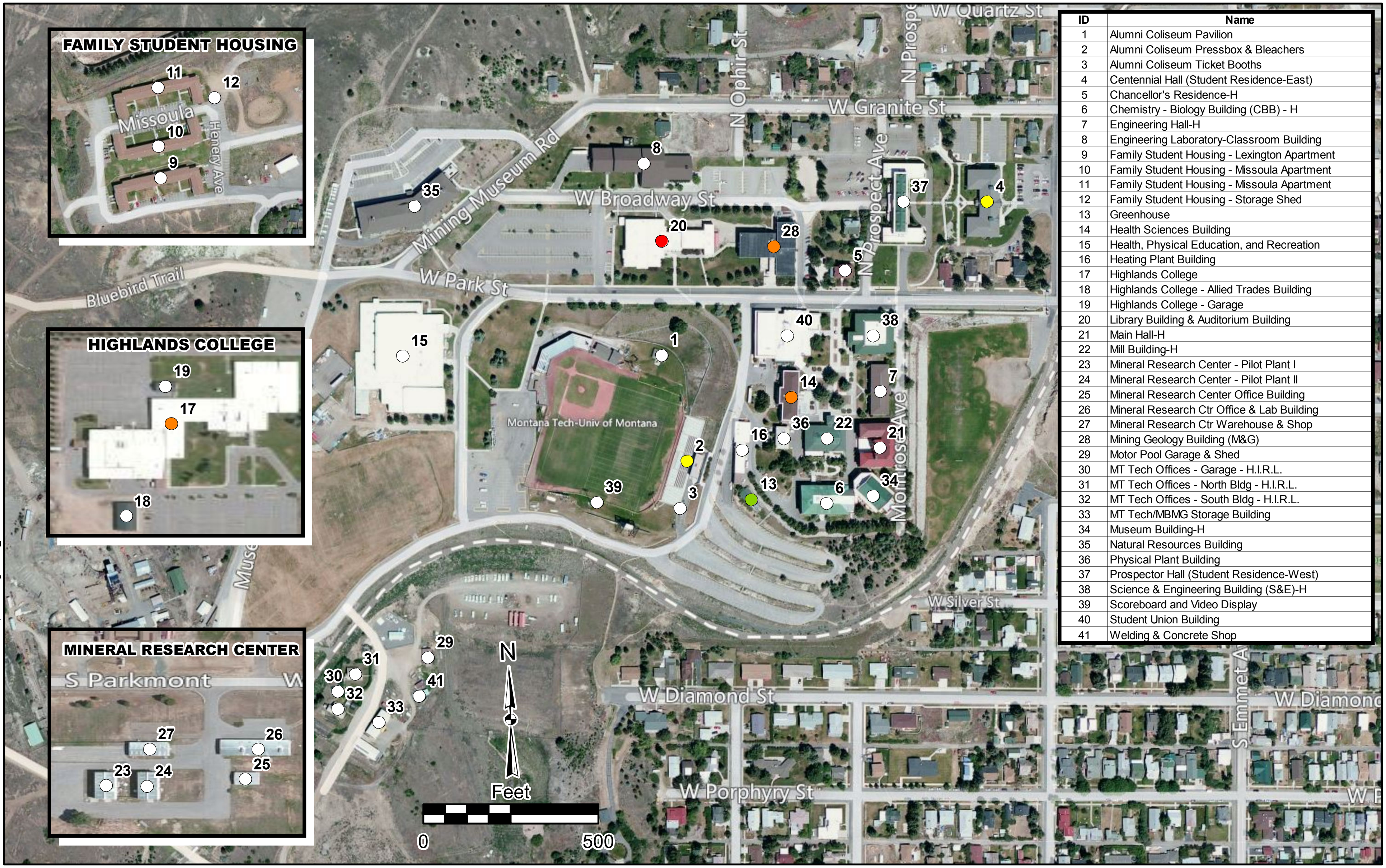
AUGUST 2013

Building Value

Montana Tech of the University of Montana - Butte, Montana

Pre-Disaster Mitigation Plan

Figure 3-5



ID	Name
1	Alumni Coliseum Pavilion
2	Alumni Coliseum Pressbox & Bleachers
3	Alumni Coliseum Ticket Booths
4	Centennial Hall (Student Residence-East)
5	Chancellor's Residence-H
6	Chemistry - Biology Building (CBB) - H
7	Engineering Hall-H
8	Engineering Laboratory-Classroom Building
9	Family Student Housing - Lexington Apartment
10	Family Student Housing - Missoula Apartment
11	Family Student Housing - Missoula Apartment
12	Family Student Housing - Storage Shed
13	Greenhouse
14	Health Sciences Building
15	Health, Physical Education, and Recreation
16	Heating Plant Building
17	Highlands College
18	Highlands College - Allied Trades Building
19	Highlands College - Garage
20	Library Building & Auditorium Building
21	Main Hall-H
22	Mill Building-H
23	Mineral Research Center - Pilot Plant I
24	Mineral Research Center - Pilot Plant II
25	Mineral Research Center Office Building
26	Mineral Research Ctr Office & Lab Building
27	Mineral Research Ctr Warehouse & Shop
28	Mining Geology Building (M&G)
29	Motor Pool Garage & Shed
30	MT Tech Offices - Garage - H.I.R.L.
31	MT Tech Offices - North Bldg - H.I.R.L.
32	MT Tech Offices - South Bldg - H.I.R.L.
33	MT Tech/MBMG Storage Building
34	Museum Building-H
35	Natural Resources Building
36	Physical Plant Building
37	Prospector Hall (Student Residence-West)
38	Science & Engineering Building (S&E)-H
39	Scoreboard and Video Display
40	Student Union Building
41	Welding & Concrete Shop

Content Value

- Unknown
- $0 - $500,000
- $500,001 - $1,000,000
- $1,000,001 - $10,000,000
- $10,000,001 - $32,000,000

AUGUST 2013

Content Value

Montana Tech of the University of Montana - Butte, Montana

Pre-Disaster Mitigation Plan

Figure 3-6

Constructed in 1910, Engineering Hall was the third building on campus. The building is two stories high, has 13,416 square feet and its primary function is for classrooms and offices. Originally a gymnasium, Engineering Hall was remodeled to include a large drawing room with sixty drafting tables, a small auditorium and a suite of offices. The second floor consisted of more offices, a file room, a blueprint room and two drafting rooms. Currently located in Engineering Hall are the office of the Associate Vice Chancellor for Student Affairs/Dean of Students, Career Services, Montana Tech Learning Center, classrooms, and the Professional and Technical Communication Department, which is part of the College of Letters, Sciences and Professional Studies, Social Sciences, and Information Technology. An underground tunnel system connects Engineering Hall, the Science and Engineering Building, Main Hall and the Museum Building.

The Chemistry and Biology Building, originally known as the Chemistry and Metallurgical building, has undergone a complete renovation. Constructed in 1921, the building is four stories high, has 44,966 square feet and its primary function is for classrooms and offices. The renovation added new classrooms and 16 new labs. Offices for faculty and graduate students were also added as well as research labs. The building has a newly remodeled state-of-the-art multi-media classroom.

The Science and Engineering Building was constructed in 1925. The building has three floors and 34,899 square feet of space, its primary function is classrooms and offices. Remodeling in 1980 expanded and converted the building from a gymnasium into classrooms and laboratories. The gymnasium was considered one of the finest facilities in the state for indoor sports. The building has a newly remodeled state-of-the art multi-media classroom. Department offices in this building include General Engineering, Environmental Engineering and Safety, Health and Industrial Hygiene, which are part of the School of Mines and Engineering.

The construction materials and techniques used during the late 19^{th} and early 20^{th} century cause historical buildings to be more at risk for earthquakes. After a historic earthquake event in 1959, Engineering Hall was outfitted with steel plates for reinforcement. The Mill Building was retrofitted with a steel plate frame system in 1999, and the Chemistry Building was retrofitted with reinforced concrete.

3.7.2 Campus Research

Montana Tech currently has over 100 ongoing research programs with a total value in excess of $15,000,000. Some researchers have many years invested into their work. Currently, over 50 faculty and staff, and 150 graduate and undergraduate students actively participate in the campus research enterprise which is comprised of four research units. The Center for Advanced Mineral and Metallurgical Process is an engineering, consulting, research, development, and testing facility that provides services to industrial clients worldwide. The Mine Waste Technology Program educates professionals and the general public about the latest information regarding mine and mineral waste cleanup methods and research. The Montana Bureau of Mines and Geology provides extensive advisory, technical, and informational services on geology, mineral, energy, and water resources in the state. The Center for Environmental Remediation and Assessment Center's primary objective is to promote, coordinate, and foster growth in statewide research activities that are focused in environmental science and engineering. **Table 3.7-1** shows the locations of research labs and their purpose.

TABLE 3.7-1
LABORATORY LOCATIONS AT MONTANA TECH

Building	Rooms	Purpose
Chemistry Biology Building	106, 205, 305, 308	Teaching and Research Lab
Chemistry Biology Building	109 ,110, 206, 208, 209,301	Research only
Science & Engineering Building	108,109,110,111,112, 204, 206, 207, 208, 211, 212, 214, 216	Teaching and Research Lab
ELC Building	101,103,104 105,108,112,116,122,123, 202, 204, 205, 206, 307	Mercury Lab and CAMP Lab Teaching and Research Lab
Main Hall	002	Research only
Mining/Geology Building	007, 202	Teaching and Research Lab
Natural Resources Building	102, 104A, 105, 106, 109, 110, 111 225, 229, 339, 356	Bureau of Mines Research Labs Petroleum Engineering Teaching & Research Labs
Highlands College	HC 125, HC 127, HC 128	Machine Shop, Welding Shop & Automotive Shop Teaching Labs

The 1919 Legislative Assembly established the Montana Bureau of Mines and Geology as a public service agency and a research department of the institution. The MBMG, located in the Natural Resources Building on the Montana Tech campus, is the only earth science research agency in Montana State Government, and is responsible for assisting in development of the state's mineral, energy and groundwater resources. Reports on MBMG research are made available to the public through formal publications and by replies to individual inquiries. MBMG projects include both applied research and public service. Its work comprises field and laboratory study, collection of samples and information, interpretation of data, and compilation of statistics on all mineral resources - metallic and non-metallic minerals, fuels, and groundwater. Projects are undertaken in cooperation with the U.S. Geological Survey, and other federal, state, and local agencies. Laboratories are equipped with modern instrumentation for all essential work. New instruments of greater range, adaptability or efficiency are added periodically.

Significant MBMG Data holdings/services include:

Ground Water: MBMG holds about 250,000 paper documents in the GWIC database. These records are stored in filing cabinets in NRB 329 and are the only complete collection of the official state records on water-well construction, and in many cases are the only extant copies of these documents. Several smaller collections of 5,000 – 20,000 documents, including water quality analyses and field inventory sheets, are also located in NRB 329 and 320. Approximately 45,000 of the 250,000 documents have been scanned and can be backed up from MBMG servers.

Other ground-water data holdings include paper project files for almost all studies completed before the mid-1980s, such as eastern Montana coal studies, state wide geothermal studies, and saline seep investigations. Photographs documenting agricultural and mining related environmental problems are also part of MBMG's archives.

Geologic Maps: Nearly all of MBMG's geologic mapping exists as GIS files and layers on servers in NRB 204. MBMG has moved to a "print-on-demand" method of distributing these maps so loss of the files and layers would be devastating. Extensive paper field records for each geologic map exist in MBMG files, most are stored in NRB 208.

Mines and minerals: MBMG is the repository for more than 14,000 mining maps and 3,800 claim files related to Montana's historical mines. The agency commonly accepts donations of these items from mining companies, retired geologists, and other state geologic surveys. The mine claim files contain irreplaceable geologic reports, assay results, resources and reserves, production and past ownership information, news clippings, and pictures. Additionally, the MBMG gathers its own property-specific data that are added to the files. The files and maps are unique and time-sensitive and are not available electronically. A complete value of this collection has not been made. However, recently donated data for the Black Butte iron deposit was appraised at over $1.1 million, representing the present day cost of re-generating these data. Most mine-related material is stored in NRB 217 and an extensive air photo collection is stored in NRB 115.

Publications: The Montana Bureau of Mines and Geology stores irreplaceable original and archival copies of all its publications in the "stacks" located in Room 108 in the basement of the Museum Building. Also stored in the "stacks" are publications to be sold to MBMG's world-wide customer base. Most of these documents are not available in electronic format and their loss would severely limit knowledge about Montana's geologic resources as developed since 1919. All new publications are in digital formats and are stored on MBMG's servers.

Seismic: The MBMG stores original seismograms that date back to the early 1960s from Montana seismograph stations. Seismograms before July 2000 were recorded exclusively on paper and are the only copy of these valuable historic records. Since 2000, digital copies of most seismograms exist in MBMG or USGS servers, but not all scientifically valuable data are included. The paper seismograms are stored on the first floor of the Museum Building in the "stacks" along with other Bureau publications. The scientific value of these time-dependent records is very large because there is no way to replace them if damaged or destroyed.

Superfund: MBMG is the repository for a majority of information concerning the underground mines in Butte, such as underground mine maps and information relating to the flooding of the underground mines and Berkeley Pit. The data set includes one-of-a-kind field books, historical Anaconda Company reports, and other information. A small amount of the data holding has been converted to electronic storage. MBMG also archives Superfund-related information for the entire Upper Clark Fork River drainage from Butte to Garrison, Montana. Most of these records are stored in NRB 205.

3.7.3 Mineral Museum

Located on the second and third floors of the Museum Building, the Mineral Museum exhibits over 1,300 minerals. Minerals from around the world and locally are displayed. Rare and exotic minerals along with common specimens line several cases on two levels. Since 1900, the Mineral Museum has acquired specimens mostly through the donations of individual collections. Special specimens in the collection include the Highland Centennial Gold Nugget, a 400 pound smoky quartz crystal, blue Yogo sapphires and polished agates.

3.7.4 Special Collections

Montana Tech's Library is the primary information source for the university. It provides resources and services which support the academic needs of students and faculty. The collection includes on-line access to more than 41,000 journals, 1,000 newspapers and 41,625 e-books in more than 60 subject-specific databases. The print journal collection consists of over 1,900 titles numbering over 58,000 issues. The library owns 80,000 topographic and geologic maps. An extensive book and reference collection in print, and publications from the U.S. Government, the State of Montana, and other state and foreign governments total more than 100,000 items. It is the only U.S. Patent Library in Montana and provides patent and trademark information and access to 7 million patents.

Art pieces housed in the Library include:

LIBRARY ENTRANCE

- Tree Sculpture (green stones and bronze, quartz base) in display case
- Quilt hanging on entrance wall

FIRST AND SECOND FLOORS

- 93 Oil Paintings on all walls, Floors 1 and 2, Offices (103, 104), Backroom (106) and Storage room (210)

FIRST FLOOR – IN or NEAR OFFICES

- Framed Lithograph, Orphan Girl Mine (105)
- Ivory Figurine and Eskimo Collections in 2 Display Cases (Outside of 106 and 107)
- Watercolor, Abstract Art and Framed Map (107)

- Watercolor of Green Dragon (108)

FIRST FLOOR BACKROOM (106)
- Framed Pencil Drawing, Supervisors at Mine
- Watercolor, Skier in Woods
- Framed Pen and Ink Drawing, Montana Tech Library
- Framed Enhanced Photo, Butte Union Hall

STAIRCASE
- Oil Painting (Enchanting Hour) on Staircase Landing
- Two Framed Maps at bottom of Staircase

SECOND FLOOR, ARCHIVES (213)
- 1 Framed Map, 3 Oil Paintings of prospectors, on walls

The Superfund Collection is maintained by the Montana Tech Library as a subset of their larger state and federal government documents programs. Historical superfund documents are housed on the second floor of the library, and new superfund documents are kept in the reference section on the first floor. Rare books are kept in the Special Collections. An Institutional Archives has been started.

Library resources and art work ranked by “Save First” consist of the following:

1. 1st Floor – Special Collections, Room 111, to right of front entrance door - a room of rare, irreplaceable books
2. 2nd Floor - Archives, Room 213 – irreplaceable institution papers and publications
3. 1st and 2nd Floors – Oil Paintings (on all walls)
4. 1st Floor – Ivory Collection (two glass cases)
5. 2nd Floor - U.S. Government Document Collection
6. 2nd Floor - 80,000 Maps
7. 2nd Floor - 50,000 Books

3.7.5 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. Montana Tech currently does not have a plan in place for visitors to the campus.

High attendance at athletic events presents an increased risk of human loss in the event of a catastrophic event. The Alumni Stadium contains a football field that seats 3,360. The Montana Tech HPER Center is the athletic complex located on the Montana Tech campus with a total outside capacity of 1,650 for soccer and rugby events. Various activities for the general public occur throughout the day in the HPER. This multi-use facility serves as a center for the institution's and communities recreational and civic activities and has an indoor capacity of 2,000.

Cultural events for the general public occur throughout the year and are generally held in conference rooms in the Student Union, the Library Auditorium and the HPER Complex.

The hub of student activities is the Student Union with services including: vending, ticket sales, locker check-out/rental, information bulletin boards, TV room, lounges/study spaces, telephones, Student Union and Student Activities Office, Associated Students of Montana Tech Office, Student Activities Council office, KMSM radio station, the Technocrat student newspaper, information concerning clubs and organizations, Marcus Deli, and the mail and copy center.

4.0 RISK ASSESSMENT

A risk assessment was conducted to address requirements of the 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 presented by 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.

This section includes a description of the hazard identification and ranking methodology, a hazard profile for nine (9) hazards organized from high to low by rank: severe summer weather, severe winter weather, hazardous material incidents, utility interruption, terrorism, earthquakes, communicable disease, structure fire, and volcanic eruption. A single-point risk assessment of the earthquake hazard was completed using FEMA's HAZUS software and spatial coordinates and campus building characteristics. Supporting documentation is presented in **Appendix C**.

4.1 METHODS

The hazard risk assessment requires information about what hazards have historically impacted the campus and what hazards may present risks in the future. The following sections describe the methods used to identify, rank and profile the hazards.

4.1.1 Hazard Identification

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 Butte-Silver Bow County Hazard Mitigation Plan (2010) (**Appendix E**) which listed the following hazards for the county:

1) Earthquake
2) Wildfire
3) Severe Winter Storms
4) Hazardous Material Incidents
5) Severe Summer Weather (Thunderstorm, Wind, Hail)

The second phase of the hazard profiling process entailed meetings with the Montana Tech PDM Advisory Committee and stakeholders for input on what hazards identified in the Butte-Silver Bow County Hazard Mitigation Plan were applicable to the Montana Tech and Highlands College campuses.

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.

Hazards for the 2013 PDM Plan update were reviewed by the Advisory Committee who determined that one additional hazard should be profiled in the plan; utility interruption. As such, hazards profiled in the Montana Tech PDM Plan include (in alphabetical order):

- Communicable Disease
- Earthquakes
- Hazardous Material Incidents
- Severe Summer Weather
- Severe Winter Weather
- Structure Fire
- Terrorism, Civil Unrest, and Violence
- Utility Interruption
- Volcanic Eruption

4.1.2 Hazard Profiles

Hazard profiles were prepared for each of the identified hazards and are presented within this section according to their rank (see *Section 4.1.3*). The level of detail for each hazard is generally limited by the amount of data available.

Each hazard profile contains a description of the hazard and the history of occurrence, the vulnerability and area of impact, the probability and magnitude of future events, and an evaluation of how future development is being managed to reduce risk. The methodology used to analyze each of these topics is further described below.

Description and History

A number of databases were used to describe and compile the history of hazard events profiled in this plan. This data was supplemented by input from the State of Montana's Hazard Mitigation Plan, the Butte-Silver Bow County Hazard Mitigation Plan, campus officials, newspaper accounts, and internet research. The two primary databases used included the National Climatic Data Center (NCDC) Storm Events Database and Spatial Hazard Events and Losses Database for the United States (SHELDUS). Much of the hazard data is specific to Butte-Silver Bow County, with few actual events being attributed to the Montana Tech campus.

The NCDC Storm Events database receives Storm Data from the National Weather Service. The NWS service receives their information from a variety of sources, including county, state and federal emergency management officials, local law enforcement officials, skywarn spotters, NWS damage surveys, newspaper clipping services, the insurance industry and the general public. Storm Data is an official publication of the National Oceanic and Atmospheric Administration (NOAA) which documents the occurrence of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce.

SHELDUS is a county-level hazard data set for the United States for 18 different natural hazard events types. For each event the database includes the date, location, property losses, crop losses, injuries, and fatalities that affected each county. The database includes every loss causing and/or deadly event between 1960 through 1975 and from 1995 onward. Between 1976 and 1995, SHELDUS reflects only events that caused at least one fatality or more than $50,000 in property or crop damages.

Vulnerability and Area of Impact

Vulnerabilities are described in terms of critical facilities, structures, population, and socioeconomic values that can be affected by the hazard event. Hazard impact areas describe the geographic extent a hazard could impact the campus. Most hazards have a varying level of risk based on a mapped area of intensity. However, in the case of a university campus, the hazards are considered to affect the entire campus uniformly.

Probability and Magnitude

Probability of a hazard event occurring in the future was assessed based on hazard frequency over a 100 year period. Hazard frequency was based on the number of times the hazard event occurred divided by the period of record. If the hazard lacked a definitive historical record, the probability was assessed qualitatively based on regional history and other contributing factors. Probability was broken down as follows:

- Highly Likely – greater than 1 event per year (frequency greater than 1).
- Likely – less than 1 event per year but greater than 1 event every 10 years (frequency greater than 0.1 but less than 1).
- Possible – less than 1 event every 10 years but greater than 1 event every 100 years (frequency greater than 0. 01 but less than 0.1).
- Unlikely – less than 1 event every 100 years (frequency less than 0.01)

The magnitude or severity of potential hazard events was evaluated for each hazard. Magnitude is a measure of the strength of a hazard event and is usually quantified by the damage caused by the hazard event; either fatalities/injuries caused, or property damage.

Future Development

The impact to future development was assessed based on potential opportunities to limit or regulate development in hazard areas. Impacts were assessed through a narrative on how future development could be affected by the hazards. Plans, ordinances and/or codes currently in place were identified that could be revised to better protect future development in the campus from damage caused by natural and man-made hazards.

4.1.3 Hazard Ranking and Priorities

In ranking the hazards, the PDM Advisory Committee reviewed a Calculated Priority Risk Index (CPRI) work sheet completed on the hazards by the contractor. The CPRI examines four criteria for each hazard (probability, magnitude/severity, warning time, and duration), the risk index for each according to four levels, then applies a weighting factor (**Table 4.1-1**). The result is a score that has been used to rank the hazards. Each hazard profile presents its CPRI score with a cumulative score sheet included in **Appendix C**. **Table 4.1-2** presents the results of the CPRI scoring for all hazards.

The PDM Advisory Committee elected to re-rank the hazards based on what hazards could be mitigated to reduce the risk of injuries/fatalities and damage to campus buildings and infrastructure. The list below presents the prioritized list of hazards for the Montana Tech campus.

1 – Severe Winter Weather
2 – Severe Summer Weather
3 – Utility Interruption
4 – Earthquake
5 – Hazardous Material Incidents
6 – Structure Fire
7 – Communicable Disease
8 – Terrorism & Violence
9 – Volcanic Eruption

TABLE 4.1-1
CALCULATED PRIORITY RISK INDEX

CPRI Category	Degree of Risk			Assigned Weighting Factor
	Level ID	Description	Index Value	
Probability	Unlikely	▪ Rare with no documented history of occurrences or events. ▪ Annual probability of less than 0.01.	1	45%
	Possibly	▪ Infrequent occurrences with at least one documented or anecdotal historic event. ▪ Annual probability that is between 0.1 and 0.01.	2	
	Likely	▪ Frequent occurrences with at least two or more documented historic events. ▪ Annual probability that is between 1 and 0.1.	3	
	Highly Likely	▪ Common events with a well documented history of occurrence. ▪ Annual probability that is greater than 1.	4	
Magnitude/ Severity	Negligible	▪ Negligible property damages (less than 5% of critical and non-critical facilities and infrastructure). ▪ Injuries or illnesses are treatable with first aid and there are no deaths. ▪ Negligible quality of life lost. ▪ Shut down of critical facilities for less than 24 hours.	1	30%
	Limited	▪ Slight property damages (greater than 5% and less than 25% of critical and non-critical facilities and infrastructure). ▪ Injuries or illnesses do not result in permanent disability and there are no deaths. ▪ Moderate quality of life lost. ▪ Shut down of critical facilities for more than 1 day and less than 1 week.	2	
	Critical	▪ Moderate property damages (greater than 25% and less than 50% of critical and non-critical facilities and infrastructure). ▪ Injuries or illnesses result in permanent disability and at least one death. ▪ Shut down of critical facilities for more than 1 week and less than 1 month.	3	
	Catastrophic	▪ Severe property damages (greater than 50% of critical and non-critical facilities and infrastructure). ▪ Injuries or illnesses result in permanent disability and multiple deaths. ▪ Shut down of critical facilities for more than 1 month.	4	
Warning Time	Less than 6 hours	Self explanatory.	4	15%
	6 to 12 hours	Self explanatory.	3	
	12 to 24 hours	Self explanatory.	2	
	More than 24 hours	Self explanatory.	1	
Duration	Less than 6 hours	Self explanatory.	1	10%
	Less than 24 hours	Self explanatory.	2	
	Less than one week	Self explanatory.	3	
	More than one week	Self explanatory.	4	

TABLE 4.1-2 MONTANA TECH CALCULATED PRIORITY RANKING INDEX SUMMARY					
Hazard	**Probability**	**Magnitude and/or Severity**	**Warning Time**	**Duration**	**CPRI Score**
Severe Summer Weather	Highly likely	Limited	6-12 hours	< 24 hours	3.05
Severe Winter Weather	Highly likely	Limited	12 - 24 hours	< 1 week	3.00
Hazardous Material Incidents	Likely	Limited	< 6 hours	< 24 hours	2.75
Utility Interruption	Likely	Negligible	< 6 hours	> 1 week	2.65
Terrorism	Possibly	Limited	< 6 hours	> 1 week	2.50
Earthquake	Possibly	Limited	< 6 hours	< 1 week	2.40
Communicable Disease	Likely	Negligible	12 - 24 hours	> 1 week	2.35
Structure Fire	Possibly	Limited	< 6 hours	< 24 hours	2.30
Volcanic Ash	Unlikely	Negligible	< 6 hours	> 1 week	1.75

The Calculated Priority Risk Index scoring method has a range from 0 to 4. "0" being the least hazardous and "4" being the most hazardous situation.

4.1.4 <u>Assessing Vulnerability – Estimating Potential Losses</u>

The FEMA Hazards of the United States – Multi-Hazard (HAZUS-MH) earthquake loss estimation methodology was used for the single-point risk assessment for this project. This is a software program that uses mathematical formulas and information about building stock, local geology and the location and size of potential earthquakes, economic data, and other information to estimate losses from a potential earthquake. A "Level 2" HAZUS analysis was performed which required input of specific information about the campus' building characteristics. Results of the HAZUS earthquake analysis is presented in *Section 4.5*.

The remainder of this section presents hazard profiles organized by adjusted rank.

4.2 SEVERE WINTER WEATHER

CPRI SCORE = 3.00

Description and History

The winter weather hazard profiled below includes several weather conditions that occur from late fall through early spring (generally November through April). Snow, blizzards, extended cold and high winds frequently occur together but also occur independent of one another during these months.

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 livestock and people. Winter storms may be categorized as sleet, ice storms or freezing rain, heavy snowfall or blizzards, and low temperatures. Blizzards are most commonly connected with blowing snow and low visibility. Winter also brings sustained straight line winds that can be well over 50 mph.

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.

A combination of temperatures to 30 below zero and high winds can close roads, threaten disruption of utilities, limit access to rural homes, impede emergency services delivery and close businesses. Such storms also create hazardous travel conditions, which can lead to increased vehicular accidents and threaten air traffic. Motorists stranded due to closed roads/highways may present a shelter problem.

The National Weather Service provides short-term forecasts of hazardous weather to the public by producing regularly-scheduled severe weather outlooks and updates on various forms of hazardous weather including blizzards and wind chill. Warning and Advisory Criteria for winter weather is presented in **Table 4.2-1**.

TABLE 4.2-1
WARNING AND ADVISORY CRITERIA FOR WINTER WEATHER

Winter Weather	Winter Weather Advisory	Winter Storm/Blizzard Warning
Snow	2-5 inches of snow in 12 hours	6 in. or more in 12 hours, or 8 inches in 24 hours
Blizzard	(see blowing snow)	Sustained winds or frequent gusts to 35 mph with visibility below a ¼ mile for 3 hours or more
Blowing Snow	Visibility at or less than a ½ mile.	Visibility at or less than a ½ mile in combination with snowfall at or greater than 6 inches and/or freezing precipitation
Ice/Sleet	(see freezing rain/drizzle)	Accumulations of ¼ inch or more of ice.
Freezing Rain/Drizzle	Light precipitation & ice forming on exposed surfaces.	None
Wind Chill	Wind chills of -20 to -39 degrees with a 10 mph wind in combination with precipitation	Wind chills -40 degrees or colder with a 10 mph wind in combination with precipitation.

Source: National Weather Service

Snow storms and bitterly cold temperatures are common occurrences in Butte-Silver Bow County and on the Montana Tech campus and generally do not cause any problems as residents are used to winter weather and are prepared for it. Sometimes, however, blizzards can occur and overwhelm the ability to keep roads passable. Heavy snow and ice events also have the potential to bring down power lines and trees. Extreme wind chill temperatures may harm residents if unprotected outdoors or if heating mechanisms are disrupted. Severe winter weather events on the Montana Tech campus are presented in **Table 4.2-2**.

TABLE 4.2-2 MONTANA TECH SEVERE WINTER WEATHER EVENTS	
Date	**Comments**
10/11/1911	Butte received 18 inches of snow and lost telephone and telegraph services
5/27/1927	Butte received 22 inches of snow and lost telephone and electrical services
12/19-25/1983	Temperatures remained below zero and on December 23rd reached a record minus 52° F
6/3/2001	A late season storm dropped over a foot of snow in Butte causing numerous power outages from snow loaded on foliage covered branches
1/7/2003	Sprinkler heads in a Montana Tech dorm froze and broke causing over $10,000 in damages
3/23/2008	Snow and ice fell from the roof of 1300 W. Park Street and caused $5,538 in damage to a mounted exhaust fan
12/13/2008	Analytical instrumentation equipment damaged from a power outage causing $800 in damage

Table 4.2-3 presents winter weather events with reported damages from the SHELDUS database for Butte-Silver Bow County.

TABLE 4.2-3 BUTTE-SILVER BOW COUNTY SEVERE WINTER WEATHER EVENTS WITH DAMAGES; 1960-2012					
Date	**Injuries**	**Fatalities**	**Property Damage**	**Crop Damage**	**Remarks**
2/25/1961	0	0	$798	$798	High Wind
3/1/1961	0.04	0	$1,562	$0	High Wind
12/21/1961	0.07	0	$89	$0	High Wind and Thunderstorms
1/5/1962	0.13	0	$46,875	$0	High Gusty Wind
1/22/1962	0	0	$1,630	$0	High Wind
2/22/1962	0	0	$74	$0	High Wind, Snow, Blowing Snow, and Cold
11/19/1962	0.07	0	$6,579	$0	High Winds
2/1/1963	0.04	0	$139	$0	Freezing Rain, High Wind, Snow
4/5/1964	0	0	$31	$0	Snow and Drifting Snow
5/3/1964	0	0.04	$13,889	$0	Snow and High Wind
12/15/1964	0	0	$65,789	$0	High Wind, Blowing Snow, Severe Cold
1/15/1967	0	0	$6,140	$0	High Wind
4/29/1967	0	1	$0	$0	Snowstorm
9/19/1968	0	0	$2,344	$23,438	Heavy Snow, Wind
1/1/1969	0	0	$542	$0	Cold And Snow
1/26/1969	0	0	$5	$0	Lightning
3/3/1971	0	0	$921	$0	Wind, Snow
1/9/1972	0	0	$4,848	$0	Strong Winds
1/16/1972	0	0	$9,211	$0	Strong Winds
2/16/1972	0	0	$953	$0	High Wind
2/22/1972	0.18	0	$2,512	$0	High Wind
3/5/1972	0	0	$921	$0	High Winds

TABLE 4.2-3 BUTTE-SILVER BOW COUNTY SEVERE WINTER WEATHER EVENTS WITH DAMAGES; 1960-2012					
Date	Injuries	Fatalities	Property Damage	Crop Damage	Remarks
4/18/1973	0	0	$54,688	$0	Blizzard
1/29/1974	0	0	$4,076	$0	Wind
12/26/1974	0	0	$787	$0	High Winds
4/7/1975	0	0	$43,750	$0	Winter Storm (Severe Blizzard)
10/15/1980	0	0	$6,908	$0	Snow
11/14/1981	0	0	$25,000	$0	Strong Winds
9/18/1983	0	0	$6,007	$601	Severe Storm-Snow
3/2/1985	0	0	$4	$0	Heavy Snow
2/15/1988	0	0	$174	$0	High Winds
5/30/1988	0	0	$1,215	$0	Heavy Snow
9/17/1988	0	0	$48,611	$0	Severe Storm-Snow
12/13/1988	0	0	$1,215	$1,215	High Wind
1/15/1989	0	0	$12	$0	High Winds
1/31/1989	0	0	$27,911	$279	Blizzard
2/1/1989	0	0	$161,588	$162	Severe Cold
4/27/1989	0	0	$236	$0	Winter Storm
5/28/1989	0	0	$3,684	$0	Winter Storm
10/28/1989	0	0	$6,140	$0	Heavy Snow
11/9/1989	0	0	$115	$0	High Wind
11/26/1989	0	0	$44	$0	Heavy Snow
1/8/1990	0	0	$10,938	$0	High Wind
3/12/1990	0	0	$190	$0	Winter Storm
4/27/1990	0	0	$2,734	$0	Winter Storm
11/22/1990	0	0	$23,649	$0	High Winds
11/29/1990	0	0	$5,833	$0	High Winds
12/18/1990	0	0	$109	$0	Heavy Snow
3/11/1991	0	0	$385	$0	Heavy Snow
10/16/1991	0	0	$172,811	$0	Wind
1/23/1992	0	0	$2	$0	High Winds
8/22/1992	0	0	$357	$35,666	Winter Storm
8/25/1992	0	0	$0	$1,439	Frost/Freeze
2/18/1993	0	0	$994	$0	Heavy Snow
10/7/1993	0	0	$7,955	$0	Winter Storm
11/3/1993	0	0	$795	$7,955	High Winds
2/23/1994	0	0	$13,545	$0	Winter Storm
3/19/1994	0	0	$97	$0	Heavy Snow
3/23/1994	0	0	$51	$0	Heavy Snow
4/25/1994	0	0	$6,434	$0	Heavy Snow, Winter Storm
11/1/1994	0	0	$19,301	$0	High Winds
11/16/1994	0	0	$6,434	$0	Heavy Snow
11/29/1994	0	0	$19,301	$0	High Winds
3/24/1995	0	0	$75,000	$0	Winter Storm
11/18/1996	0.09	0.18	$0	$0	Winter Storm
2/15/2001	0.25	0.13	$0	$0	Winter Weather
12/29/2004	0	0	$17,098	$0	Heavy Snow
12/15/2006	0	0	$1,268	$0	High Wind
11/12/2007	0	0	$11,974	$0	High Wind
6/10/2008	0	0	$82	$0	Heavy Snow

TABLE 4.2-3
BUTTE-SILVER BOW COUNTY SEVERE WINTER WEATHER EVENTS WITH DAMAGES; 1960-2012

Date	Injuries	Fatalities	Property Damage	Crop Damage	Remarks
TOTALS	0.87	1.35	$955,355	$71,551	

Source: SHELDUS, 2013 (adjusted to 2011 dollars).

Note: Often casualties and damage information are listed without sufficient spatial reference. In order to assign the damage amount to a specific county, the fatalities, injuries and dollar losses were divided by the number of counties affected from this event.

The tables above indicate that winter storms, high winds, and extended cold have affected Butte-Silver Bow County and the Montana Tech campus.

Hazard Effects and Vulnerabilities

Structures at Montana Tech are constructed to withstand reasonable snow loads. The greatest risk to Montana Tech during winter weather events are loss of power and the potential for frozen pipes during extended extreme cold temperatures. Frozen water lines would hinder the steam plant's ability to provide heat to campus buildings creating an exposure hazard. Frozen water lines during extreme cold spells may also hinder firefighting efforts on campus. Icicles and snow falling from buildings presents a risk to students on campus.

Since winter storms and cold spells typically do not cause major structural damage, the greatest threat to the population is the potential for utility failure during a cold spell. Although cold temperatures and snow are normal in Butte-Silver Bow County, handling the extremes can go beyond the capabilities of the community. Should the temperatures drop below -15 for over 30 days or several feet of snow fall in a short period of time, the magnitude of frozen water pipes and sewer lines or impassable streets could result in disastrous conditions for many people. If power lines were to fail due to snow/ice load, winds, or any other complicating factor, the situation would be compounded.

Sheltering of the campus population could present significant logistical problems when maintained over a period of more than a day. Transportation, communication, energy (electric, natural gas, and vehicle fuels), shelter supplies, medical care, food availability and preparation, and sanitation issues all become exceedingly difficult to manage in extreme weather conditions. Local government resources could be quickly overwhelmed. Mutual aid and state aid might be hard to receive due to the regional impact of this kind of event.

Montana Tech has a *Cold Weather Policy and Procedures* (2012) that outlines steps to ensure that severe winter weather does not result in incidents that cause property damage. The policy includes conducting an inventory before the cold season and regular preventative maintenance checks during periods of extreme weather. There are procedures on what do to if a flood does occur from frozen pipes.

Probability and Magnitude

Severe winter storms and extended periods of extreme cold occur in Butte-Silver Bow County and the Montana Tech campus multiple times each year. Therefore, the probability of a severe winter storm event occurring in the future is rated as "highly likely".

The Butte-Silver Bow County Hazard Mitigation (**Appendix E**) plan states that snow storms and extreme cold temperatures are common occurrences in Butte-Silver Bow County and generally do not cause problems in the community as residents and the county are used to winter weather and prepared for conditions. On occasion, blizzards have overwhelmed the city's ability to keep roads passable. The most common problem associated with extreme winter weather is poor road conditions that either make roads impassable or cause vehicular accidents. Poor road conditions may hinder emergency response time to campus. Vehicular accidents due to poor road conditions are the greatest losses that occur during winter weather events. Winter storms and cold spells typically do not cause major structural damage in Butte-Silver Bow County, however, heavy snow loads have the potential to collapse roofs and break tree limbs.

Future Development

The State of Montana has adopted the 2011 International Building Codes (IBC) and these codes are recognized by Montana Tech as the standards for construction. The IBC includes a provision that buildings must be constructed to withstand a constant velocity of 75 mph constant velocity and three second gusts of 90 mph. Buildings must be designed to withstand a snow load of 30 pounds per square foot minimum.

4.3 SEVERE SUMMER WEATHER

CPRI SCORE = 3.05

Severe summer weather includes thunderstorms, wind, hail, lightning, tornadoes, and microbursts that typically occur between May and October of each year.

Description and History

A severe thunderstorm is defined by the National Weather Service as a thunderstorm that produces wind gusts at or greater than 58 mph (50 knots), hail 1-inch or larger, and/or tornadoes. Although not considered “severe”, lightning and heavy rain can also accompany thunderstorms. Thunderstorms can produce intense downburst and microburst wind. In addition, strong winds, defined below, can occur outside of thunderstorms when the overall weather conditions are favorable.

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, which possess remarkable strength and can cause widespread damage. The most violent tornadoes are capable of tremendous destruction with wind speeds of 300 mph or more. Maximum wind speeds in tornadoes are confined to small areas and vary over short distances. 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.

The NWS provides short-term forecasts and warnings of severe summer weather to the public by producing regularly-scheduled severe weather outlooks and updates on various forms of hazardous weather including tornado warnings, as listed below.

- *Severe Thunderstorm Warning*: Any thunderstorm wind gust equal to or greater than 58 mph; any hail size 1-inch or larger.
- *High Wind*: Sustained winds of 40 mph for an hour or any gust to 58 mph (non-convective winds).
- *Tornado Warning:* A violently, rotating column of air extending from the base of a thunderstorm to the ground.

Severe summer weather events on the Montana Tech campus are presented in **Table 4.3-1**. Except as otherwise noted, the source of this data is from the Montana Department of Administration (DOA), Risk Management and Tort Defense (RMTD), Property Casualty Insurance Information System (PCIIS).

TABLE 4.3-1 MONTANA TECH SEVERE SUMMER WEATHER EVENTS WITH DAMAGES	
Date	**Comments**
6/15/1996	A lightning strike caused over $4,000 in damages to campus communication equipment.
7/30/1998	An hour long thunderstorm produced two inches of rain and hail in uptown Butte. Montana Street was impassible during the storm's peak. Debris from the hill washed down large rocks and boulders which covered the streets in the uptown area (National Weather Service).
7/24/2000	Thunderstorm winds damaged utility poles and downed trees onto several cars on Park Street. Power outages occurred in uptown Butte (National Weather Service).
7/16/2002	Wind damage occurred throughout Butte. Wind speeds of 70 mph were reported. Damage included trees and fences blown over. A large billboard was blown over.
10/28/2003	Wind took the chimney off Main Hall causing over $12,000 in damages.
11/19/2003	Wind damaged the roof on the Engineering Lab and Classroom building.
7/26/2009	Lightning caused damage to circuit boards in the heating plant at Prospector Hall causing $17,946 in damage.
8/6/2009	Large hail damaged roof components and windows at Highlands campus causing $750 in damage.

Source: DOA, RMTD, PCIIS

Table 4.3-2 presents severe summer storm events from the NCDC database indicating the magnitude of events in Butte-Silver Bow County.

TABLE 4.3-2 BUTTE-SILVER BOW COUNTY SEVERE SUMMER WEATHER REPORTS; 2000 - 2012					
Date	**Event**	**Magnitude**	**Date**	**Event**	**Magnitude**
7/22/2000	Thunderstorm Wind	56 kts.	8/31/2008	Hail	0.75 in.
7/24/2000	Thunderstorm Wind	50 kts.	8/31/2008	Hail	0.75 in.
8/4/2001	Hail	1.50 in.	8/6/2009	Hail	1.00 in.
6/21/2002	Hail	1.00 in.	8/6/2009	Hail	2.00 in.
8/7/2002	Hail	0.88 in.	8/6/2009	Thunderstorm Wind	60 kts.
5/20/2004	Hail	0.75 in.	8/6/2009	Thunderstorm Wind	52 kts.
8/8/2005	Hail	0.88 in.	8/26/2010	Thunderstorm Wind	50 kts.
5/10/2007	Hail	0.88 in.	7/14/2011	Hail	1.00 in.

Source: National Weather Service (NCDC, 2013)
Notes: kts. = knots; in. = inches

There have been no Presidential Disaster Declarations or State Disasters issued for the severe summer weather in Butte-Silver Bow County. **Table 4.3-3** presents severe summer weather events in the county with reported damages since 1960.

TABLE 4.3-3 BUTTE-SILVER BOW COUNTY SEVERE SUMMER WEATHER EVENTS WITH DAMAGES; 1960 - 2012					
Date	**Injuries**	**Fatalities**	**Property Damage**	**Crop Damage**	**Remarks**
5/16/1960	0	0	$3,750	$0	Wind
6/9/1960	0	0	$375	$0	Thunderstorm and Heavy Rain
7/29/1960	0	0	$375	$0	Tornado
8/15/1960	0	0	$375	$0	Thunderstorm
9/4/1960	0	0	$0	$18,750	Severe Thunderstorms and High Wind
5/10/1961	0	0	$1,562	$0	High Winds and Thunderstorms
5/30/1961	0	0	$798	$7,979	Thunder, Heavy Rain, and Hail Storms

TABLE 4.3-3 BUTTE-SILVER BOW COUNTY SEVERE SUMMER WEATHER EVENTS WITH DAMAGES; 1960 - 2012					
Date	**Injuries**	**Fatalities**	**Property Damage**	**Crop Damage**	**Remarks**
6/29/1961	0	0	$798	$7,979	Thunder, High Wind, Hail, Heavy Rain
6/6/1964	0	1.2	$0	$0	Heavy Rain
7/2/1964	0	0	$0	$1,562	Hail, Thunderstorms
8/18/1964	0	0	$0	$1,562	Lightning
6/6/1967	0	0	$350,000	$0	Hail
6/21/1967	0	0	$350,000	$0	Heavy Rain
7/19/1968	0	0	$1,131	$0	High Wind, Thunderstorms
6/27/1970	0	0	$62,057	$62,057	Strong Winds, Hail
6/30/1973	0.09	0	$239	$0	Lightning
9/12/1973	0	0	$16	$0	Wind Storm
7/26/1974	0	0	$761	$0	High Winds
7/8/1975	0	0	$2,100	$0	Hail
7/9/1975	0	0	$21,000	$0	Hail
8/7/1975	0	0	$438	$4,375	Hail and Wind
6/18/1980	0	1	$0	$0	Lightning
8/24/1981	0	0	$125,000	$0	Wind
6/20/1985	0.02	0	$2,492	$2,492	Hail/Wind
6/15/1987	0	0	$5,048	$505	Thunderstorm Wind, Hail
6/18/1987	0	0	$101	$101	Hail
5/10/1989	0	0	$921	$0	Thunderstorm Winds
7/2/1990	0	0	$875	$0	Thunderstorm Wind
8/8/1990	0	0	$8,750	$0	Thunderstorm Wind
6/16/2005	0	0	$5,833	$0	Hail
4/29/2008	0	0	$3,977	$0	Strong Wind
8/6/2009	0	0	$53,571	$0	Hail
8/9/2009	0	0	$5,357	$0	Hail
4/8/2010	0	0	$564	$0	Wind
5/3/2010	0	0	$459	$0	Wind
	0.11	2.2	$1,008,725	$107,362	

Source: SHELDUS, 2013 (adjusted to 2012 dollars)

Note: Often casualties and damage information are listed without sufficient spatial reference. In order to assign the damage amount to a specific county, the fatalities, injuries and dollar losses were divided by the number of counties affected from this event.

Hazard Effects and Vulnerabilities

Structures, utilities, and vehicles are most at risk from severe summer weather. Windstorms can break power poles and damage roofs. Windstorms can uproot trees and break large limbs potentially causing damage to surrounding structures when they fall. Large amounts of debris left in the path of a windstorm can block routes potentially delay emergency response vehicles.

Severe hailstorms also cause considerable damage to buildings and automobiles, but rarely result in loss of life. Damages from hail storms in Butte-Silver Bow County have included broken windows on homes, power outages, and vehicular damages. 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. 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.

Lightning strikes can cause electrical surges which have the potential to damage campus communication equipment. Lightning can also result in wide-spread power outages which can disrupt teaching and research activities.

Probability and Hazard Magnitude

Severe summer weather affects areas with significant tree stands, as well as areas with exposed property, major infrastructure, and aboveground utility lines. Severe hailstorms can also cause considerable damage to buildings and automobiles, but rarely result in loss of life.

The history of severe summer weather events in Butte-Silver Bow County and on the Montana Tech campus indicate that they occur more than once per year. Therefore, the probability of this hazard occurring in the future is rated as "highly likely".

Future Development

The State of Montana has adopted the 2011 International Building Code which stipulates that buildings throughout the state must be constructed to withstand a constant velocity of 75 mph and three second gusts of 90 mph.

4.4 UTILITY INTERRUPTION

CPRI SCORE = 2.65

Description and History

Utility outages can be caused by almost any hazard, but they can also occur because of human error or equipment failures. Electric, natural gas, telephone, sewer and water are all important services to the campus that could become problematic should a long term outage occur. C populations needing powered medical equipment would be additionally threatened by a long term power outage. Natural gas is used as a heat source for many campus residents. Should that utility be lost in the winter months, the concerns associated with extended cold could be significant. Telephone services are most critical for 911 communications, and the rapid dispatch of needed emergency services. Cell phones would also be lost if telephone service went down. The Montana Tech campus is connected to the Butte-Silver Bow County public water supply and wastewater system. Should those services be lost, the campus would be without water and sewer services. Any of these disruptions can be handled in a short time frame, but can quickly become problematic in long term situations.

Utility failures can be caused by many hazard events. Anything from an earthquake to a car hitting a power pole could cause utilities to fail. Hazards that can rapidly compromise utility systems include earthquakes, severe summer weather, and severe winter weather. A wildfire in the region could disrupt the power supply if a major transmission line was burned and damaged. Utility interruption on the Montana Tech campus occurs two to three times each year. Below is a recount of several incidents.

Spring 2003 – Power was lost for three days on the Montana Tech campus when a wire burned out in a utility tunnel. The heating plant did not have a generator so it was not possible to pump heat around to the buildings and there were no lights to the dorms. The incident occurred on a Thursday night and was resolved by Monday morning so classes weren't canceled.

June 29, 2013 - A lightning strike in the vicinity of the Butte-Silver Bow Courthouse disrupted telephone service. The lightning strike rendered the administrative phones to the Law Enforcement Administration Building, Butte-Silver Bow Detention Center, the Butte-Silver Bow Fire Department as well as the 911 Center non-operational for a period of at least two weeks. Alternate numbers were established for emergency purposes.

August 2, 2013 – The top of a tree broken off by high winds knocked out a power line on the Montana Tech hill. The storm blew through Butte, causing power outages, downed trees and triggering alarm systems. An estimated 1,150 NorthWestern Energy customers in Central Butte and on Butte's west side were without power for the evening (The Montana Standard, August 2, 2013, Tree down: *Storm topples tree, power line on Montana Tech hill*).

Montana Tech has the following plans and policies discussing Utility Interruption, as summarized below: Section F of the *Campus Emergency Action and Crisis Protocol Manual (2012)* outlines Provisions for Critical Research on Campus. It states: "Research on the Montana Tech campus is ongoing and an important part of our mission. A disaster or emergency situation could leave individual buildings or the entire campus without utilities including gas, electricity, water, and telephone. The lack of utilities could literally wipe out years of research." No mitigation actions are discussed; instead, the plan indicates what research, facility, and safety features may not be operational when utilities are lost.

Chapter 5 of the *Campus Emergency Action and Crisis Protocol Manual (2012)* provides helpful tips for individuals displaced by Storm or Power Outage (Loss of Electricity/Gas or Damage to Heating Plant). The plan includes response-related activities but could reference the Montana Tech PDM Plan for corresponding mitigation-related activities that would lessen the impact of Utility Interruption.

Hazard Effects and Vulnerabilities

Critical campus facilities are vulnerable to utility outages. Some critical campus facilities do have back-up generators in case of an electricity outage. Others, however, may have limited functionality following an event due to a utility failure.

Utility failures typically do not impact structures directly. A long-term utility outage during extended cold could result in a large number of frozen water pipes inside campus buildings. Most often, economic losses occur during long-term utility outages. These losses would be most felt by all university services that require electricity or water to operate.

Without services such as heated shelters, food, and drinking water, the campus population could suffer. Significant casualties would not be expected since these services could be available in a nearby community. If not, necessary sheltering and feeding provisions would be made to protect the population. Significant relocations of vulnerable populations and disruption of normal campus lifestyles would be expected.

Probability and Magnitude

Due to the history of utility interruption on the Montana Tech campus and in Butte-Silver Bow County, the probability of future utility outages causing impacts to the campus is considered likely.

Future Development

Utility interruption is not expected to impact future development on the Montana Tech campus. A new natural gas feed was recently laid to the Montana Tech campus which provides redundant service and should ensure greater reliability.

4.5 EARTHQUAKE

CPRI SCORE = 2.40

Description and History

An earthquake is ground shaking and radiated seismic energy caused most commonly by a sudden slip on a fault, volcanic or magmatic activity, or other sudden stress changes in the earth. An earthquake of magnitude 8 or larger on the Richter Scale is termed a great earthquake. Fortunately, Montana has not experienced a great earthquake in recorded history. A great earthquake is not likely in Montana but a major earthquake (magnitude 7.0-7.9) occurred near Hebgen Lake in 1959 and dozens of active faults have generated magnitude 6.5-7.5 earthquakes during recent geologic time.

Butte-Silver Bow County is located in a zone of earthquake activity known as the Intermountain seismic belt. The zone extends from northwest Montana southward to southern Utah. **Figure 4-1** below shows the occurrence and magnitude of earthquakes within the northern portion of the Intermountain Seismic Belt. (Source: MBMG, 2010)

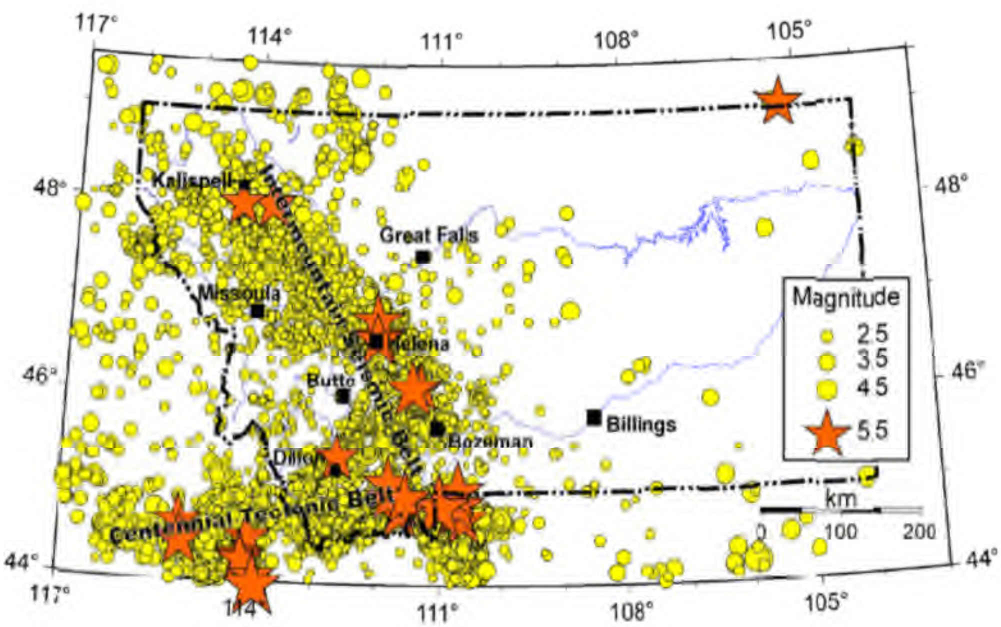


Figure 4-1 Intermountain Seismic Belt and Earthquake Occurrence in Montana

Earthquakes are measured by two variables, magnitude and intensity. The magnitude of an earthquake, as measured on the Richter scale, reflects the energy release of an earthquake. The intensity of an earthquake is gauged by the perceptions and reactions of observers as well as the types and amount of damage. The intensity of an earthquake is rated by the Modified Mercalli Scale. This scale ranks the intensity from I to XII. An earthquake rated as a I, would not be felt except by very few people under especially favorable circumstances. An intensity rating of XII on the other hand would result in total destruction. Butte-Silver Bow County is generally rated as having an intensity level of VIII. Damage is predicted to be slight in buildings designed specifically for the seismic zone. Buildings not constructed to meet the standards for the seismic zone would experience considerable damage with partial collapse.

Below is a description of the historic earthquakes which have occurred in Montana and the surrounding region from the Montana Bureau of Mines and Geology (MBMG) publication entitled *Probabilistic Earthquake Hazard Maps for the State of Montana* (2005).

1897 Southwest Montana Earthquake – An earthquake with an estimated magnitude between 6.4 and 6.8 occurred somewhere southeast of Dillon on November 4, 1897. This earthquake was felt over an area of approximately 193,000 square miles. Shaking in Dillon lightly damaged the courthouse and broke windows and was strongly felt in Butte, but resulted in little damage owing to the small population at this early state of Montana's settlement.

1925 Clarkston Valley Earthquake – Montana's first destructive earthquake occurred just north of Three Forks. The 1925 quake was felt over a region of nearly 305,000 square miles and is estimated to have been 6.6 in magnitude. An aftershock of magnitude 6.0 occurred 49 minutes later. Schools, churches, and other buildings of masonry construction were heavily damaged in the nearby towns of Three Forks, Logan and Manhattan. Two persons were injured but no fatalities resulted. In addition to building damage, rock falls and landslides blocked railroad lines passing through the area, trapping passengers. Direct damages from the earthquake were estimated at $300,000 ($1.8 million adjusted to 1980 values).

1935 Helena Earthquakes – In 1935, the capital city of Helena was struck by a series of destructive earthquakes. A magnitude 6.3 earthquake on October 18th was followed by a magnitude 6.0 event on October 31st. The new Helena High School was completely destroyed, and about 60 percent of the buildings in town suffered structural damage.

1947 Virginia City Earthquake – A magnitude 6.3 earthquake struck the southern Gravelly Mountains, a very sparsely populated regions south of Virginia City On November 23, 1947. The epicentral area was uninhabited and virtually no tourists were in the surrounding region given the late season. Damage was limited to a few sites in the Madison Valley and fallen chimneys and broken windows in Virginia City.

1959 Hebgen Lake Earthquake – The largest earthquake in Montana's history struck Hebgen Lake near Yellowstone National Park on August 18, 1959. The 7.3 magnitude quake killed 28 people and caused $26 million in damage (MBMG, 2005). The most disastrous effect of the quake was a massive landslide on the wall of the Madison River Canyon, blocking the river's flow and forming Quake Lake. Steel plates were installed on the Engineering building at Montana Tech after it sustained damages. The epicenter of the earthquake was roughly 100 miles south of the Butte.

2005 Dillon Earthquake – A magnitude 5.6 earthquake that was felt throughout western Montana occurred about 10 miles north of Dillon. It was the largest Montana earthquake in 41 years and caused significant damage to masonry buildings in Dillon, sheared anchor bolts from beams on a freeway overpass, and generated ground cracks in the epicenter area. Two buildings on the UM-Western campus in Dillon required significant repairs and about 50 masonry chimneys in Dillon were damaged. No injuries were reported. The main shock was followed by an extensive aftershock sequence, the largest of which occurred almost 12 hours later with a magnitude of 4.2.

Montana Tech posted numerous different posters on campus promoting October as Earthquake Awareness Month and advertising participation in the Rocky Mountain Shakeout held on October 23, 2013.

Section F of the *Campus Emergency Action and Crisis Protocol Manual* (2012) outlines Provisions for Critical Research on Campus. It states: "Research on the Montana Tech campus is ongoing and an important part of our mission. Because our area is situated in earthquake country, we need to be prepared for earthquakes and other disasters. A mild to moderate quake has the potential to knock things off counters and shelves or bring down ceiling tiles that could knock over work on benches. It can also cause equipment to shake loose of connections or fall to the floor. Some pre-planning to earthquake proof your lab could help protect your vital work. A strong earthquake would do considerably more damage to buildings and its contents."

Chapter 5 of the *Montana Tech Campus Emergency Action and Crisis Protocol Manual* (2012) provides helpful tips for individuals displaced by Earthquake and Building Collapse and provides an Earthquake Preparation section that deals with mitigation. Mitigation actions proposed and hereby integrated into this Plan and include:

- Bolt down water heaters and gas appliances, if possible
- Check the integrity and flexibility of gas and electrical connections.
- Place large and heavy objects on lower shelves and secure shelves to walls
- Brace or anchor high or top-heavy objects, including book shelves that are over 42 inches.
- Move tall furniture away from exits. Do not use tall furniture as room dividers and do not stack furniture.
- Store bottled goods, glass and other breakables in low or closed cabinets.
- Keep batteries, portable radios, flashlights, drinking water, non-perishable foods and as a sufficient number of fire extinguishers and first aid kits on hand.
- Back up data and sensitive information and store duplicates off-site.

Hazard Effects and Vulnerabilities

In the worst case scenario, an earthquake could cause serious structural damage or cause a building to collapse. Architectural damage may occur to nonbearing walls/partitions, exterior wall panels, veneer and finishes, mechanical penthouses, access floors, appendages and ornaments. Non-secured objects and building contents such as file cabinets, art and other valuable objects, laboratory equipment, book cases, and computer and communication equipment can fall during an earthquake causing property damage or injury/fatality. Most earthquake-related injuries result from collapsing walls, flying glass, and falling objects, or people trying to move more than a few feet during the shaking.

Building and content damage from earthquakes result from ground acceleration, which is the force of ground movement during an earthquake and drift which is the stiffness of the structure and the amount of horizontal movement that occurs during an earthquake. The U.S. Geological Survey (2008) has created peak ground acceleration (PGA) maps which show the strength of seismic shaking having a 2 percent probability of being exceeded in a 50-year period. The strength of the shaking is measured as a percent of the acceleration of gravity (%g). The Montana Tech campus are in the 18-20%g PGA zone; a force which could damage older unreinforced masonry buildings. According to Qamar (2008), at 9.2%g an earthquake is felt by all with many frightened. Some heavy furniture is moved with a few instances of fallen plaster. Damage is considered slight. At 18%g, damage is negligible in buildings of good design and construction, slight to moderate in well-built ordinary structures, and considerable in poorly-built or badly designed structures. Some chimneys may be broken, and the shaking is noticed by people driving cars. At 34%g, damage is slight in specially designed structures, considerable in ordinary substantial buildings with partial collapse, and great in poorly built structures. Chimneys and walls may fall and heavy furniture is overturned.

Severe earthquakes can also damage non-flexible utilities such as natural gas, sewer, and water mains. Fire is the most common hazard to follow after an earthquake due to broken gas lines. Earthquakes may also disrupt emergency systems and falsely set off fire alarms and fire sprinkler systems. Water damage from broken water lines and sprinklers is another hazard following an earthquake. Earthquakes have the potential of causing hazardous materials incidents, not only from stored laboratory equipment, but from storage tanks and other materials used for campus operations.

Buildings that predate current seismic code requirements are at risk to severe earthquake damage. Tier 1 seismic evaluations, funded through a FEMA grant administered by the Montana Department of Administration (DOA), Architecture and Engineering Division (A&E) were completed at 13 buildings on the Montana Tech campus including the majority of classroom and dormitory buildings. The evaluations were completed in accordance with the American Society of Civil Engineers (ASCE) -31-03, *Seismic Evaluation of Existing Buildings*. The ASCE 31 Tier 1 procedure is a preliminary screening tool designed to quickly identify potential seismic deficiencies of the structural lateral-force resisting system that can lead to significant failure and/or collapse through a series of checklists. The Tier 1 evaluations were based on a review of the original building drawings, information collected during a site visit and checklists that address the structural system, non-structural elements and geologic and site hazards. Tier 1 Seismic Evaluations performed at Montana Tech (BCE, 2010) are summarized in **Table 4.5-1**. **Appendix C** presents the Tier 1 assessment reports.

TABLE 4.5-1
SUMMARY OF TIER 1 SEISMIC EVALUATIONS

Critical Structural Conditions	Recommendations
Chemistry-Biology Building	
Building in great condition; had structure renovation in 1997. Unable to determine but assumed that suspended ceilings, lights and utility lines are fully seismically supported and braced.	*Immediate*: No critical Life Safety Items identified.
	Mid Term: Establish maintenance program to clean and re-point the discolored brick areas.
	Long Term: None.
Engineering Hall	
Building in fair condition. Evidence of structural distress and deterioration in structural masonry elements. Areas of deteriorated bricks and significant cracks and displacement in west and north walls.	*Immediate*: No critical Life Safety Items identified. **Tier 2 evaluation recommended.**
	Mid Term: Investigate seismic bracing of suspended elements. Consider re-pointing and brick replacement. Upgrade/replace floor beams and column connections.
	Long Term: Dependent on Tier 2 analysis.
Engineering Hall - Engineering Lab/Classroom	
Building in very good condition. Suspended lights and mechanical piping and equipment are not diagonally braced. Corrosion noted in supports for tank in mechanical loft.	*Immediate*: No critical Life Safety items noted
	Mid Term: Investigate seismic bracing of suspended elements and classroom equipment. Address corrosion of tank supports in mechanical loft.
	Long Term: None
Health Sciences (aka Petroleum Building)	
Building in good condition. Lateral system questionable and not clearly defined. Wood partition walls in upper level classrooms do not extend to ceiling and are not braced.	*Immediat*e: No critical Life Safety Items identified. **Tier 2 evaluation recommended** due to lack of connection detailing and clear lateral system.
	Mid Term: Investigate seismic bracing of all mechanical and steam lines and suspended elements. Add bracing to partition walls.
	Long Term: None
Heating Plant Building	
Building in very good condition. Minimal to no connection of concrete topping "diaphragm" to walls. No diagonal wires on suspended lights and ceilings. Suspended pipes without lateral bracing. Early rusting of exterior brick base bearing angle.	*Immediate*: No critical Life Safety items noted
	Mid Term: Investigate seismic bracing of suspended elements. Replace parge coat on concrete walls. Maintain brick bearing angles.
	Long Term: None
HPER Complex	
Building is in very good condition. In areas with suspended ceilings, the suspended lights are vertically wired with no diagonal wires. Mechanical piping is well supported, but not diagonally braced. Corrosion was noted in supports for a tank in the mechanical loft.	*Immediate*: No critical Life Safety items noted
	Mid Term: Instigate an investigation into seismic bracing of all mechanical lines, steam lines and other suspended elements and class room equipment
	Long Term: None

TABLE 4.5-1 SUMMARY OF TIER 1 SEISMIC EVALUATIONS	
Critical Structural Conditions	**Recommendations**
Library/Auditorium Building	
Building generally in good condition. Cracks in brick veneer and masonry infill between columns in south wall but no movement of settlement/lateral displacement noted. No thermal break at column location at wall ends may be cause of veneer cracks. Suspended lights, mechanical piping and equipment are not diagonally braced. Efflorescence noted in brick in north and east walls of auditorium.	*Immediate*: No critical Life Safety items noted *Mid Term*: Investigate alternative detailing at south wall columns to provide complete thermal break. Review top of wall and roof to wall flashing in auditorium for moisture infiltration in walls. Investigate seismic bracing of suspended elements and classroom equipment. *Long Term*: None
Mining and Geology Building	
Building in great condition. Minor potential for weak or deteriorated mortar in exterior brick. Exterior brick veneer should be considered for mid to long term cleaning, minor re-pointing and sealing. Retaining walls have surface parge coat deterioration and minor spalling. Interior CMU walls not connected at top and require top restraint for seismic stability.	*Immediate*: No critical Life Safety Items noted. Address deteriorated and spalled retaining walls. *Mid Term*: Investigate interior non-bearing masonry walls and installation of top lateral restraint. *Long Term*: Clean, re-point and seal exterior brick veneer.
Museum Building	
Building in very good condition. Some shelving and IT equipment not anchored. Mechanical lines vertically supported but not braced.	*Immediate*: No critical Life Safety Items identified. **Tier 2 evaluation recommended.** *Mid Term*: Investigate seismic bracing of mechanical, steam, and suspended elements *Long Term*: None.
Prospector Hall	
Building in good condition. A significant diagonal crack in brick wall on east side. Brick mortal due for cleaning and re-pointing. Concrete steps and entry walls have experienced significant deterioration and spalling. Suspended ceiling have no diagonal wires. Suspended lights are integral with ceiling grid.	*Immediate*: No critical Life Safety items noted. Patch crack on east side should be patched and monitored. *Mid Term*: Wood roof structure over 4-story section required upgrade. Roof structure does not meet snow loading requirements. Roof does not have legitimate diaphragm and there is no connection to perimeter walls *Long Term*: Ceiling grid and suspended lights should be addressed.
Science and Engineering Building	
Building in very good condition. Connection of diaphragms to brick walls undetermined. Areas with cast slab on grade excavated in portions of mechanical area tunnels. Steam and mechanical lines lack bracing. Lights independently supported but without diagonal wires. Cracks noted in some foundation elements in crawl space.	*Immediate:* No critical Life Safety items noted *Mid Term*: Investigate seismic bracing of mechanical and steam lines and other suspended elements. Anchor office book cases and shelving. *Long Term*: None.
Student Union Building	
Building is in good condition. Per the drawings, the lateral system is questionable and not clearly defined, particularly for the original building. Significant cracks were noted in CMU walls at the rear loading dock area, lower level.	*Immediate:* No critical Life Safety items noted. **Tier 2 assessment** recommended as lack of connection detailing and clear lateral system warrants further analysis. *Mid Term*: Instigate an investigation into seismic bracing of all mechanical lines, steam lines and other suspended elements. *Long Term*: None.
Highlands Campus	
Building in very good condition. Suspended lights and mechanical piping and equipment are not diagonal braced. Storage area roof framing should be investigated in regards to wood beam to masonry wall connections, capacity of the built up 2x support beams including possible reduction in capacity of locating splices away from supports and cross grain bending of bolted ledger connection.	*Immediate:* No critical Life Safety Items identified. *Mid Term*: Investigate seismic bracing and storage area roof framing. *Long Term*: None

A Tier 2 seismic assessment was completed at Main Hall during 2010 through a FEMA grant administered by DOA-A&E. The assessment involved brick testing and a structural conditions evaluation to assess the level of conformance of the existing structure to the International Existing Building Code, provide results on the shear strength of the masonry walls, and address potential future renovations and their cost implications. The study revealed that the building is overall in good condition but there are gravity load deficiencies that will require roof framing upgrades during renovation. In addition, the existing floors and roof do not have legitimate diaphragms or connections to the walls so the load will not be able to properly distribute in the event of a seismic event. **Appendix C** presents the Tier 2 Seismic Report on Main Hall.

Single Point Risk Assessment

Earthquake damages can be hard to predict and assess without detailed structure information or a damage model. The FEMA HAZUS-MH earthquake loss estimation methodology was used for the risk assessment. This is a software program that uses mathematical formulas and information about building stock, local geology and the location and size of potential earthquakes, economic data, and other information to estimate losses from a potential earthquake. The model earthquake used for this analysis is considered the maximum credible earthquake for the area, a magnitude 6.5 earthquake on the Rocker Fault, approximately 2 miles southwest of the Montana Tech campus. The earthquake was run as a western U.S. shallow crustal non-extensional "normal" quake because this is the type MBMG has recorded for this area. A magnitude of 5 was selected because it has the greatest probability of occurring at this location. The "Level 2" HAZUS analysis required input of specific information about building characteristics and content value was conducted for critical campus facilities.

HAZUS building type was determined by reviewing available building data from the Dept. of Administrations with input from the Montana Tech Office of Environmental Health and Safety (**Table 3.4-1**) and 2010 and 2011 Tier 1 Seismic Evaluations (**Appendix C**). Details on seismic retrofits performed on select campus buildings were not available for input into HAZUS; therefore, these buildings were evaluated as though retrofits were not completed.

Based on the HAZUS analysis, buildings which would experience the most damage include: the Museum Building, Science & Engineering Building, Main Hall, Prospector Hall, Library & Auditorium Building and Centennial Hall. This is significant because these buildings provide many important campus services, have high content values, and have inherent historical value. A summary of individual building losses are provided in **Table 4.5-2** with a complete listing in ***Appendix C.*** HAZUS predicts that there would be no casualties on campus from this earthquake.

TABLE 4.5-2
HAZUS-MH EARTHQUAKE VULNERABILITY ASSESSMENT (Maximum Credible Earthquake – Rocker Fault – Magnitude 6.5)

Name	Year Built	HAZUS-MH Building Type	Seismic Retrofit	HAZUS-MH Slight Damage	HAZUS-MH Extensive Damage	Economic Loss	Total Value (Building + Contents)	Percent Loss (Economic Loss / Total Value)	Functionality				
									Day 1	Day 7	Day 14	Day 30	Day 90
Mill Building	1908	S5-L	**YES**	96.00%	67.60%	$1,583,610	$3,611,580	43.85%	4.00%	10.20%	10.20%	32.30%	64.50%
Chemistry - Biology Building	1921	RM2-L	**YES**	94.60%	65.30%	$3,632,880	$9,542,750	38.07%	5.40%	10.80%	10.80%	34.70%	72.50%
Museum Building	1940	RM2-L	NO	94.50%	64.80%	$2,851,960	$7,592,470	37.56%	5.50%	11.00%	11.00%	35.20%	73.00%
Science & Engineering Building	1925	RM2-L	NO	94.50%	64.80%	$2,408,560	$6,412,040	37.56%	5.50%	11.00%	11.00%	35.20%	73.00%
Engineering Hall	1923	URM-L	**YES**	95.70%	61.60%	$1,229,740	$2,886,370	42.61%	4.20%	14.20%	14.30%	38.30%	66.10%
Main Hall	1896	URM-L	NO	95.70%	61.60%	$3,541,370	$8,312,110	42.60%	4.20%	14.20%	14.30%	38.30%	66.10%
Prospector Hall (Student Residence-West)	1935	RM2-M	NO	95.60%	56.60%	$434,080	$6,100,750	7.12%	4.40%	11.10%	11.10%	43.30%	81.40%
Alumni Coliseum Ticket Booths	1990	S5-L	NO	93.80%	54.70%	$2,560	$7,950	32.20%	6.10%	16.00%	16.00%	45.20%	77.80%
Library Building & Auditorium Building	1977	S5-L	NO	93.80%	54.70%	$6,039,930	$38,380,700	15.74%	6.10%	16.00%	16.00%	45.20%	77.80%
Chancellor's Residence	1936	S5-L	NO	93.40%	53.30%	$302,500	$973,470	31.07%	6.50%	16.90%	16.90%	46.70%	78.90%
Centennial Hall (Student Residence-East)	1999	S5-L	NO	93.00%	51.80%	$1,421,880	$5,378,010	26.44%	7.00%	17.80%	17.80%	48.10%	80.00%
MT Tech/MBMG Storage Building	1994	S3	NO	95.00%	46.10%	$22,950	$93,850	24.45%	5.00%	16.80%	16.80%	53.80%	89.70%
Greenhouse	1976	URM-L	NO	92.60%	44.40%	$16,370	$87,040	18.81%	7.40%	23.20%	23.20%	55.50%	82.20%
Welding & Concrete Shop	1997	S3	NO	94.30%	43.90%	$53,530	$232,070	23.07%	5.70%	18.30%	18.40%	56.10%	90.80%
Highlands College	1983	S5-L	NO	78.10%	22.80%	$1,902,950	$20,915,140	9.10%	21.90%	43.20%	43.30%	77.20%	95.20%
Mineral Research Center - Pilot Plant I	1972	S3	NO	78.40%	19.10%	$17,960	$175,830	10.21%	21.60%	44.00%	44.10%	80.90%	98.20%
Mineral Research Center - Pilot Plant II	1972	S3	NO	78.40%	19.10%	$19,190	$187,860	10.22%	21.60%	44.00%	44.10%	80.90%	98.20%
Mineral Research Center Office & Lab Bldg	1972	S3	NO	78.20%	18.90%	$78,640	$775,960	10.13%	21.80%	44.30%	44.30%	81.00%	98.20%
Health, Physical Education, & Recreation	1980	RM2-L	NO	71.20%	15.50%	$1,133,040	$11,650,620	9.73%	28.70%	51.60%	51.70%	84.40%	98.60%
Natural Resources Building	2009	RM2-L	NO	71.20%	15.50%	$1,767,490	$18,174,300	9.73%	28.70%	51.60%	51.70%	84.40%	98.60%
Engineering Laboratory-Classroom Building	1984	RM2-L	NO	69.70%	14.60%	$1,174,820	$12,671,320	9.27%	30.20%	53.30%	53.40%	85.30%	98.70%
Heating Plant Building	1969	RM2-L	NO	69.20%	14.30%	$107,160	$1,176,550	9.11%	30.80%	53.90%	54.00%	85.60%	98.80%
Health Sciences Building	1953	RM2-L	NO	68.80%	14.10%	$500,740	$7,602,870	6.59%	31.20%	54.30%	54.40%	85.90%	98.80%
Mining Geology Building	1972	RM2-L	NO	68.80%	14.10%	$600,510	$9,123,700	6.58%	31.20%	54.30%	54.40%	85.90%	98.80%
Physical Plant Building	1948	RM2-L	NO	68.80%	14.10%	$22,170	$246,350	9.00%	31.20%	54.30%	54.40%	85.90%	98.80%
Student Union Building	1960	RM2-L	NO	68.80%	14.10%	$727,700	$8,084,460	9.00%	31.20%	54.30%	54.40%	85.90%	98.80%
MT Tech Offices - Garage - H.I.R.L.	1938	W1	NO	79.30%	12.80%	$1,050	$18,400	5.71%	20.60%	53.20%	53.30%	87.20%	97.70%
MT Tech Offices - North Bldg - H.I.R.L	1938	W1	NO	79.30%	12.80%	$6,140	$107,600	5.71%	20.60%	53.20%	53.30%	87.20%	97.70%
MT Tech Offices - South Bldg - H.I.R.L.	1938	W1	NO	79.30%	12.80%	$6,140	$107,600	5.71%	20.60%	53.20%	53.30%	87.20%	97.70%
Alumni Coliseum Pressbox & Bleachers	1965	W2	NO	71.50%	5.10%	$127,640	$1,963,960	6.50%	28.40%	66.50%	66.60%	94.80%	99.50%

TABLE 4.5-2
HAZUS-MH EARTHQUAKE VULNERABILITY ASSESSMENT (Maximum Credible Earthquake – Rocker Fault – Magnitude 6.5)

Name	Year Built	HAZUS-MH Building Type	Seismic Retrofit	HAZUS-MH Slight Damage	HAZUS-MH Extensive Damage	Economic Loss	Total Value (Building + Contents)	Percent Loss (Economic Loss / Total Value)	Functionality				
									Day 1	Day 7	Day 14	Day 30	Day 90

NOTES:

HAZUS-MH BUILDING TYPE

- RM2-L = Reinforced Masonry Bearing Walls with Precast Concrete Diaphragms (1-3 floors)
- RM2-M = Reinforced Masonry Bearing Walls with Precast Concrete Diaphragms (4-7 floors)
- S3 = Steel Light Frame
- S5-L = Steel Frame with Unreinforced Masonry Infill Walls Low-Rise (1-3 floors)
- URM-L = Unreinforced Masonry Bearing Walls Low-Rise (1-3 floors)
- W1 = Wood, Light Frame
- W2 = Wood, Commercial and Industrial

HAZUS-MH SLIGHT STRUCTURAL DAMAGE

- RM2 – Diagonal hairline cracks on masonry wall surfaces; larger cracks around door and window openings in walls with large proportion of openings.
- S3 – Few steel rod braces have yielded which may be indicated by minor sagging or rod braces. Minor cracking at welded connections or minor deformations at bolted connections of moment frames may be observed
- S5 – Diagonal (sometimes horizontal) hairline cracks on most infill walls; cracks at frame-infill interfaces.
- URM – Diagonal, stair-step hairline cracks on masonry wall surfaces; larger cracks around door and window openings in walls with large proportion of openings; movements of lintels; cracks at the base of parapets.
- W1 – Small plaster or gypsum-board cracks at corners of door and window openings and wall-ceiling intersections; small cracks in masonry chimneys and masonry veneer.
- W2 – Small cracks at corners of door and window openings and wall-ceiling intersections; small cracks on stucco and plaster walls. Some slippage may be observed at bolted connections.

HAZUS-MH EXTENSIVE STRUCTURAL DAMAGE

- RM2 – In buildings with relatively large area of wall openings most shear walls have exceeded their yield capacities and some of the walls have exceeded their ultimate capacities exhibited by large, through-the wall diagonal cracks and visibly buckled wall reinforcement. The diaphragms may also exhibit cracking.
- S3 – Significant permanent lateral deformation of the structure due to broken brace rods, stretched anchor bolts and permanent deformations at moment frame members. Some screw or welded attachments of roof and wall siding to steel framing may be broken. Some purlin and girt connections may be broken.
- S5 – Most infill walls exhibit large cracks; some bricks may be dislodged and fall; some infill walls may bulge out-of-plane; few walls may fall off partially or fully; some steel frame connections may have failed. Structure may exhibit permanent lateral deformation or partial collapse due to failure of some critical members.
- URM – In buildings with relatively large area of wall openings most walls have suffered extensive cracking. Some parapets and gable end walls have fallen. Beams or trusses may have moved relative to their supports.
- W1 – Large diagonal cracks across shear wall panels or large cracks at plywood joints; permanent lateral movement of floors and roof; toppling of most brick chimneys; cracks in foundations; splitting of wood sill plates and/or slippage of structure over foundations; partial collapse of “room-over-garage” or other “soft-story” configurations; small foundation cracks.
- W2 – Large diagonal cracks across shear wall panels; large slack in diagonal rod braces and/or broken braces; permanent lateral movement of floors and roof; cracks in foundations/ splitting of wood sill plates and/or slippage of structure over foundations; partial collapse of “soft-story” configurations; bolt slippage and wood splitting at bolted connections.

Probability and Magnitude

A significant seismic event would directly affect campus buildings and utilities and those in the surrounding community. The amount of damage would be related to the location and intensity of the earthquake and each building's ability to withstand the impacts. The population would have little and mostly likely no warning prior to an earthquake, so the impact to that population could be considered high with little time to take protective actions.

Hazard probability was assessed based on hazard frequency over a 10 year period. Since the earthquake hazard does not occur with an intensity to cause significant property damage or loss of life more than once every 10 years it was given a "possible" probability rating.

Future Development

Montana Tech adheres to seismic provisions in the 2011 International Building Code (IBC), as adopted by the State of Montana, for any new campus building.

CPRI SCORE = 2.75

4.6 HAZARDOUS MATERIAL INCIDENTS

Description and History

A hazardous material incident is the release of a chemical, petroleum product, or other substance that contaminates air, water, or soil threatening human health, the environment, or property. Hazardous materials, including industrial and agricultural chemicals, are commonly stored and used in Butte-Silver Bow County and are regularly transported via the regions roadways, railroads, and pipelines. A release of hazardous materials from both fixed and transportation incidents in Butte-Silver Bow pose possible threats to the Montana Tech campus.

Hazardous materials are used and stored throughout the campus and can include petroleum products, laboratory chemicals, batteries, and compressed gas cylinders. Waste materials generated from labs and research may be hazardous and can include infectious waste, radiological waste, and chromatography waste. Building renovations also have hazardous material concerns associated with asbestos, lead-based paint, and mold. Most chemicals are stored on sturdy shelves with lips for protection against spillage from minor earthquakes. Buildings with hazardous material storage are listed in **Table 3.4-1**. A complete inventory of hazardous materials is maintained on campus.

Hazardous material incidents that have occurred at Montana Tech are described below.

October 14, 2013 - A large cabinet holding approximately 100 chemicals pulled away from the wall and crashed to the floor in Main Hall 002. It appears it was failure of the bolts (the cabinet was installed about 50 years ago and was not installed properly). It is not yet known how many chemical containers broke, but there were a few, including one 30 ml bottle of an amine; the smell permeated the whole building for days. A hazardous material response team from Helena was called in to do the initial entry in hazmat suits and self-contained breathing apparatus. They cleaned up the spilled chemicals and put them in a drum for disposal. A remediation firm was then called in to wipe down all surfaces. As of November 2013, the lab was still being worked on to make it habitable once again.

January 23, 1995 - A hazardous material incident on which occurred at the Montana Tech campus involved an anhydrous ammonia tank that leaked outside the Main/MBMG building and required evacuation of the building.

Montana Tech has many plans, programs, and policies in place to ensure a hazardous material incident does not occur on campus, as summarized below. Many of the actions outlined in these documents mitigate the hazardous material incident hazard.

- Montana Tech has a *Chemical Hygiene Plan* that sets forth procedures, equipment, personal protective equipment and work practices used to protect employees from the health hazards presented by hazardous chemicals used on campus. The plan includes standard operating procedures for safety and health, criteria for the implementation of engineering control measures, measures to ensure proper operation of engineering controls, provisions for training and information dissemination, provisions for medical consultation, designation of responsible personnel, and identification of particularly hazardous substances.

- Montana Tech has established *Emergency Response Procedures for Hazardous Chemical Releases and Spills* that contain minimum specifications that must be followed by all campus laboratory workers. The procedures outline how to assess spills; identify spill control equipment; and instructions for spill control for acids, alkalis, and solvents; and mercury spills.
- Montana Tech has an established *Hazardous Waste Management and Disposal Program* designed to assure that minimal harm to people, other organisms, and the environment will result from the disposal of waste chemicals, as well as to ensure compliance with all applicable city, state and federal waste disposal regulations. Waste minimization guidelines are also included in the program.

- Montana Tech has established *Lab Checkout Procedures for Departing Researchers*. The intent of this program is to ensure that all hazardous materials used in laboratories and hazardous waste generated by researchers are disposed of properly when a research faculty, staff or student leaves Montana Tech. Proper disposition of hazardous materials is the responsibility of the principal investigator or researcher and ultimately becomes the responsibility of the department. Proper disposition of hazardous materials is required whenever a responsible individual leaves Montana Tech or transfers to a different laboratory.

- Montana Tech has a *Radiation Safety Manual* that pertains to all artificially produced radioactive isotopes which must be licensed and to any radiation-producing device or source which is capable of providing radiation in excess of the federal standards. There are also established *Emergency Response Procedures for a Radioactive Spill* which include emergency response, decontamination and spill cleanup procedures.

- Chapter 5 of the *Campus Emergency Action and Crisis Protocol Manual* (2012) provides helpful tips for individuals displaced by Hazardous Material Incidents. The plan includes response-related activities but could reference the Montana Tech PDM Plan for corresponding mitigation-related activities that would lessen the impact of a hazardous material incident.

Montana has six regional hazardous materials response teams that can provide Level A hazardous materials response and assist Montana Tech as needed.

Hazard Effects and Vulnerabilities

The Emergency Planning and Community Right-to-Know Act (EPCRA) was enacted in 1986 to inform communities and citizens of chemical hazards in their areas. Sections 311 and 312 of EPCRA require businesses to report the locations and quantities of chemicals stored on-site to state and local governments in order to help communities prepare to respond to chemical spills and similar emergencies. The volume and type of hazardous materials that flow into, are stored, and flow through communities will determine exposure to a potential release of hazardous materials. An accidental or intentional release of materials could produce a health hazard to those in the immediate area, downwind, and/or downstream.

Montana Tech has an established *Hazard Communication Program* (2006) that ensures that employees know what hazardous materials exist on the campus, how to safely use these materials, and how to deal with any hazardous material emergency that arises. The Hazard Communication Program ensures compliance with the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard, 29 CFR 1910.1200.

At the time of a hazardous material incident, Montana Tech employees should know what type of evacuation is necessary and what their role is in carrying out the plan. They should also be familiar with "shelter in place" procedures in the event of a chemical release that warrants this response. Employees must know what is expected of them in emergency situations in order to provide assurance of their safety and the safety of students from hazardous material incidents. To meet that need, Montana Tech has a policy to conduct evacuation drills of every building on campus at least once per year, and "shelter-in-place" drills when allowed. The fire department is notified and asked to participate in the drills and helps evaluate the effectiveness of the plan. The drills are often conducted without notice.

In the event of a hazardous material event, Physical Facilities is responsible for shutting down or controlling HVAC systems. These systems have the potential to distribute hazardous material fumes throughout a 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.

Probability and Magnitude

Hazardous materials incidents can cause death, serious injury, long-lasting health effects, and damage to buildings, homes, and other property. The magnitude of any hazardous material event would depend on the amount and material spilled.

Due to the number of hazardous materials events which have occurred in Butte-Silver Bow County and at the Montana Tech campus, the probability of future events is rated as "likely".

Future Development

There are no land use regulations that restrict building in the vicinity of facilities which store large quantities of hazardous materials/petroleum products.

4.7 STRUCTURE FIRE

CPRI SCORE = 2.30

Description and History

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 to structural fire due to students living in close proximity and being engaged in activities that can cause fires. Residence hall fires are often ignited by faulty appliances, lamps, overloaded outlets, smoking, cooking or candles. According to the National Fire Protection Association (NFPA), the number of reported fires in dormitories increased 17 percent from 3,200 in 1980 to 3,740 in 2009. Fires fell in the range of 2,300 to 2,700 from 1982 through 1995, and then declined further in 1996 to 1998. Estimates rapidly increased after 1998, until becoming somewhat more stable in recent years. In 2005-2009, U.S. fire departments responded to an estimated average of 3,840 structure fires in dormitories, fraternities, and sororities. These fires caused an annual average of 3 deaths, 38 injuries, and $20.9 million in property damage. Between 2005-2009, cooking equipment was involved in 81 percent of the reported dormitory fires. Structure fires in dormitories, fraternities, and sororities are more common during the evening hours between 5-11 p.m., as well as on weekends. Only 9 percent of fires in these properties began in the bedroom, but these fires accounted for almost one-quarter of the injuries. http://www.nfpa.org/categoryList.asp?categoryID=711.

A structure fire that occurred on the Montana Tech campus is described below.

February, 1990 – A fire started under the stage in the old auditorium of the Museum Building where steam heat piping was reportedly too close to a wood beam. Offices on the third floor were flooded due to fire suppression and the building was out of commission for three quarters of a year. The fire almost took out the campus phone switch.

Fire safety is essential in protecting a campus community from injuries, deaths, business interruption, and property damage resulting from fires. In an effort to standardize the information an institution publishes on fire safety, the U.S. Department of Education requires all universities that maintain on-campus student housing facilities and receive U.S. Department of Education funding to publish an annual fire safety report, maintain a fire log, and report fire statistics to the Secretary of Education. The 2011 Montana Tech fire report is presented in **Table 4.7-1**.

TABLE 4.7-1 MONTANA TECH FIRE REPORT; 2009 - 2010						
Name of Facility	**2009**			**2010**		
	Fires	**Injuries**	**Deaths**	**Fires**	**Injuries**	**Deaths**
Prospector Hall	0	0	0	**0**	**0**	**0**
Centennial Hall	0	0	0	0	0	0
Apartment Housing	0	0	0	0	0	0

The Butte-Silver Bow County Fire Department responds to over 500 emergency calls related to fire each year. These calls range in severity from false alarms and dumpster fires to residential and commercial building fires. Mutual-aid agreements are facilitated by each department and a state-wide mutual aid agreement. These agreements have proven essential to increasing the level of service provided to the constituents of the area. The mutual-aid structure provides for assistance among fire departments, thus expanding the equipment and personnel resources available to respond to an incident. This mechanism allows for increased utilization of the expensive capital equipment that is necessary for fire protection service and achieves a higher level of service in the county than could be achieved by any one fire protection entity.

Chapter 5 of the Montana Tech *Campus Emergency Action and Crisis Protocol Manual* (2012) provides helpful tips for individuals displaced by fire. The plan includes response-related activities but could reference the Montana Tech PDM Plan for corresponding mitigation-related activities that would mitigate the structure fire hazard.

Hazard Effects and Vulnerabilities

Existence of building sprinkler systems are the primary factor that determines the vulnerability from and overall impact of structural fires. All residence halls on campus have fire suppression systems in place. Numerous older buildings on campus do not have sprinklers and are at risk to structure fire. All buildings on campus have fire and smoke detection alarm systems. Campus buildings have not been reviewed for fire code compliance for at least 10 years. All hydrants on campus have been upgraded.

Montana Tech conducts fire drills of every building on campus at least once per year. The fire department is notified and asked to participate in the drills and helps evaluate the effectiveness of the plan. The drills are often conducted without notice. The building warning systems notify campus occupants of an emergency situation. All faculty, staff and students are expected to leave the building immediately anytime the fire alarm sounds or you are notified in person that you are to evacuate the building.

Probability and Hazard Magnitude

Most campus fires are small and are confined to burning contents within a building without sustaining major damage to the building itself. This does not however, preclude the possibility of a large scale structure fire on the Montana Tech campus. As such, the probability of future events is rated as "possible".

Future Development

All buildings to be renovated or constructed on campus have fire and smoke detection alarm systems, in accordance with Butte-Silver Bow County fire code requirements.

4.8 COMMUNICABLE DISEASE

CPRI SCORE = 2.35

Description and History

Communicable diseases, sometimes called infectious diseases, are illnesses caused by organisms such as bacteria, viruses, fungi and parasites. Sometimes the illness is not due to the organism itself, but rather a toxin that the organism produces after it has been introduced into a human host. Communicable disease may be transmitted (spread) either by: one infected person to another, from an animal to a human, from an animal to an animal, or from some inanimate object (doorknobs, table tops, etc.) to an individual. A pandemic is a global disease outbreak. Human diseases, particularly epidemics, are possible throughout the nation.

Communicable disease or biological agents could be devastating to the population or economy of Montana Tech. Human diseases when on an epidemic scale, can lead to high infection rates in the population causing isolation, quarantines and potential mass fatalities. Diseases that have been eliminated from the U.S. population, such as smallpox, could be used in bioterrorism.

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. The following list gives examples of biological agents or diseases that could occur naturally or be used by terrorists as identified by the Centers for Disease Control and Prevention (2013).

Category A

Definition - The U.S. public health system and primary healthcare providers must be prepared to address various biological agents, including pathogens that are rarely seen in the United States. High-priority agents include organisms that pose a risk to national security because they:

- Can be easily disseminated or transmitted from person to person;
- Result in high mortality rates and have the potential for major public health impact;
- Might cause public panic and social disruption; and
- Require special action for public health preparedness.

Agents/Diseases

- Anthrax (*Bacillus anthracis*)
- Botulism (*Clostridium botulinum* toxin)
- Plague (*Yersinia pestis*)
- Smallpox (variola major)

- Tularemia (*Francisella tularensis*)
- Viral hemorrhagic fevers (filoviruses [e.g., Ebola, Marburg] and arenaviruses [e.g., Lassa, Machupo])

Category B

Definition - Second highest priority agents include those that:

- Are moderately easy to disseminate;
- Result in moderate morbidity rates and low mortality rates; and
- Require specific enhancements of CDC's diagnostic capacity and enhanced disease surveillance.

Agents/Diseases

- Brucellosis (*Brucella* species)
- Epsilon toxin of *Clostridium perfringens*
- Food safety threats (e.g., *Salmonella* species, *Escherichia coli* O157:H7, *Shigella*)
- Glanders (*Burkholderia mallei*)
- Melioidosis (*Burkholderia pseudomallei*)
- Psittacosis (*Chlamydia psittaci*)
- Q fever (*Coxiella burnetii*)
- Ricin toxin from *Ricinus communis* (castor beans)
- Staphylococcal enterotoxin B
- Typhus fever (*Rickettsia prowazekii*)
- Viral encephalitis (alphaviruses [e.g., Venezuelan equine encephalitis, eastern equine encephalitis, western equine encephalitis])
- Water safety threats (e.g., *Vibrio cholerae*, *Cryptosporidium parvum*)

Category C

Definition - Third highest priority agents include emerging pathogens that could be engineered for mass dissemination in the future because of:

- Availability;
- Ease of production and dissemination; and
- Potential for high morbidity and mortality rates and major health impact.

Agents

- Emerging infectious diseases such as Nipah virus and hantavirus

These diseases/bioterrorism agents can infect populations rapidly, particularly through groups of people in close proximity such as schools and workplaces.

Historically, the Spanish influenza outbreak after World War I in 1918-1919 caused 9.9 deaths per 1,000 people in the State of Montana (Brainerd and Siegler, 2002). Historical records from newspapers show that the influenza outbreak was so bad in 1918 that residents were quarantined from November 30 to December 17 after 18 people died and 53 new cases were discovered. In 1979 and again in late 2003, a flu epidemic hit the U.S. infecting hundreds of people. The swine flu (H1N1) pandemic of 2009 caused a number of fatalities in the country.

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).

The Montana Department of Public Health and Human Services (DPHHS) manages a database of reportable communicable disease occurrences. The communicable disease summary for Butte-Silver Bow County between 2002 and 2012 is presented in **Table 4.8-1**. Communicable disease statistics for the Montana Tech campus are included in the Butte-Silver Bow County totals presented below. Campus statistics are not maintained separate from the county, except for sexually transmitted diseases.

TABLE 4.8-1
BUTE-SILVER BOW COUNTY COMMUNICABLE DISEASE SUMMARY; 2001 - 2011

Disease	2002	2003	2005	2006	2007	2008	2009	2010	2011	2012
Vaccine Preventable Diseases										
Hepatitis A	0	0	0	0	0	0	0	0	0	0
HIB	0	0	0	0	0	0	1	0	0	0
Meningitis	0	3	2	3	0	0	0	0	0	1
Meningococcal	0	1	0	0	0	0	0	0	1	0
Mumps	0	0	0	0	0	1	0	0	0	0
Pertussis	0	0	3	2	14	0	0	2	0	2
Strep Pneumonia	0	0	0	0	0	0	1	0	1	0
Tuberculosis	0	0	1	1	0	0	0	0	0	0
Varicella	0	0	0	0	5	4	0	6	1	2
Enteric Diseases										
Campylobacter	1	0	3	4	1	2	3	2	0	4
E Coli	1	1	0	1	0	0	0	0	0	0
Giardia	1	0	2	3	3	1	2	0	0	0
Salmonella	3	2	5	5	3	1	1	2	3	3
Shigella	0	0	0	0	0	0	0	0	0	0
Other Communicable Diseases										
Sexually	50	71	-	100	109	96	66	97	100	100

Source: Montana Department of Public Health and Human Services, 2012

<u>Hazard Effects and Vulnerabilities</u>

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 age 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 hit 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.

Chapter 8 of the *Campus Emergency Action and Crisis Protocol Manual* (2012) contains the *Montana Tech Pandemic Response Plan.* In the event of a pandemic influenza, Montana Tech will play an integral role in protecting the health and safety of students, faculty, staff, and their families. The plan is implemented at three levels:

- Level 1 activates when cases of human-to-human transmission of avian or other pandemic flu are confirmed anywhere in the world.
- Level 2 activates when suspected cases of avian or other pandemic flu appear on campus or in the Butte area.
- Level 3 activates when there are confirmed cases on campus.

The decision to close the campus and discontinue services would be made based on the severity of the pandemic outbreak and direction given by the Governor's Office. If and when a pandemic occurs and affects the campus, the Montana Tech Pandemic Plan will be implemented. Montana Tech will also become a part of the Butte-Silver Bow Pandemic Plan and will follow their instructions. The Butte-Silver Bow Health Department will be responsible for the dissemination of available vaccine and anti-viral medications in the area. The Montana Tech community may or may not have access to them depending on availability.

Montana Tech has several other plans, programs, and policies in place to protect students and employees against infectious material, as summarized below. Many of the actions outlined in these documents mitigate the communicable disease hazard.

- Montana Tech's *Bloodborne Pathogen Exposure Control Plan* (2006) is a written exposure control plan designed to protect employees from possible infection caused by bloodborne pathogens including, but not limited to, Human Immunodeficiency Virus (HIV), Hepatitis B Virus (HBV), and Hepatitis C Virus (HCV). The Plan Includes exposure determination, compliance methods, Hepatitis B Virus vaccination program, and post-exposure medial evaluation.

- Montana Tech's *Bloodborne* Pathogen Student Policy (2006) stipulates that students in any academic, research, or occupational program who are at risk for bloodborne pathogen exposure are required to present documentation of serologic evidence of immunity to hepatitis B (HBV), either by vaccination or previous infection.

- Chapter 6 of the *Campus Emergency Action and Crisis Protocol Manual* (2012) provides helpful tips for individual non-displacement crises and includes the "Health" hazard. The plan includes response-related activities but could reference the Montana Tech PDM Plan for corresponding mitigation-related activities that would lessen the impact of communicable disease hazard.

An immunization policy is in effect and applicable for all new and returning students at Montana Tech. For students born after December 31, 1956, proof of two separate doses of measles and rubella immunization is required before students can register for courses. This policy is in effect at all units of the Montana University System.

Probability and Magnitude

The probability of an epidemic that could significantly affect the Montana Tech campus is difficult to assess based on history, current data and the rapid advancement in medical science. Individual infectious diseases will likely be reported on an annual basis giving this hazard a probability rating of "likely".

The magnitude of a communicable disease outbreak varies from common viral outbreaks to widespread bacterial infection. Almost any communicable disease that enters the regional population could overwhelm local health resources as would any rapidly spreading bioterrorism event for which there is no available vaccine or containment capability.

Future Development

There are no land use regulations for future development that could impact the communicable disease hazard.

4.9 TERRORISM AND VIOLENCE

CPRI SCORE= 2.05

Description and History

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 of 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, try to convince citizens that their government is powerless to prevent terrorism, or to get immediate publicity for their causes. Local, state, and federal law enforcement officials monitor suspected terrorist groups and try to prevent or protect against a suspected attack. 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. Terrorists might also target large public gatherings, such as a campus sporting event.

The ***Virginia Tech Massacre*** was a school shooting that took place on April 16, 2007, on the campus of Virginia Tech. Seung-Hui Cho, a senior at Virginia Tech, shot and killed 32 people and wounded 17 others in two separate attacks, approximately two hours apart, before committing suicide. The massacre is the deadliest shooting incident by a single gunman in U.S. history. Cho had previously been diagnosed with a severe anxiety disorder.

The attacks received international media coverage and drew widespread criticism of U.S. gun culture. It sparked intense debate about gun violence, gun laws, gaps in the U.S. system for treating mental health issues, the perpetrator's state of mind, the responsibility of college administrations, privacy laws, and other issues. The Virginia Tech Review Panel, a state-appointed body assigned to review the incident, criticized Virginia Tech administrators for failing to take action that might have reduced the number of casualties. The panel's report also reviewed gun laws and pointed out gaps in mental health care as well as privacy laws that left Cho's deteriorating condition in college untreated.

The aftermath of the shootings at Virginia Tech focused renewed attention on how colleges and universities deal with campus safety and security issues. Beyond traditional measures to protect students, employees, and property, safety and security efforts undertaken by higher education institutions now must also address the possibility of terrorist actions, such as bomb threats and threats of physical violence against campus research facilities, individual faculty, and administrators.

A survey conducted by the *National Association of College and University Business Officers* (2008) addressed the ability of college campuses to deal with a lone-shooter scenario; specifically, their ability to assess mental health issues and threats on campus. About 76 percent of public four-year college and university respondents said that a behavioral assessment team (BAT) exists on their campus. An additional 13 percent of respondents reported their campus was developing such a team. A BAT deals with matters of crisis, disturbing behavior, and medical and psychiatric situations of individual students, faculty, and/or staff in order to determine needs and appropriate responses. Fewer than half of the respondents reported that their campus had a threat assessment team (TAT). A TAT assists in assessing threatening situations and developing risk abatement plans that minimize the potential risk for violence. Mental health services are available at virtually all public four-year colleges and universities through the health center or a separate counseling center. More than 60 percent of public four-year institutions reported the availability of a campus hotline to assist staff, faculty, and students with behavioral and mental health issues. About two-thirds of respondents said a protocol exists to address the needs of troubled faculty and staff. Montana Tech does not have a formal BAT or TAT at this time. As things come up pertaining to campus violence or terrorism, the Safety Committee is convened. In about 2008, Montana Tech participated in a lone-shooter exercise with Butte Silver-Bow. The exercise was conducted between classes and paint balls were used to simulate live ammunition.

Violence on college campuses is common. 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.

In recent years, hate crimes have occurred on many college campuses. Hate crimes occur when a perpetrator targets a victim because of his or her perceived membership in a certain social group. Examples of such groups include but are not limited to: racial group, religion, sexual orientation, ethnicity or gender identity. Incidents may involve physical assault, damage to property, bullying, harassment, verbal abuse or insults, or offensive graffiti or letters (hate mail). A recent incident that caused a lock-down of the Montana Tech campus is described below.

February 6, 2012 - Two Montana Tech students were arrested in connection with shooting a gun from a residence on W. Granite Street Sunday that caused a lockdown on the campus. Police had to call out the SWAT team about 2 a.m. to make entry into the home, after police say the occupants refused repeated requests to open the door. The two men were found inside the home intoxicated with a firearm and evidence that the gun had been fired, according to the police report. (The Montana Standard, February 6, 2012, *Two Montana Tech Students Face Felony Charges in Connection with Shooting Gun*).

Table 4.9-1 presents crime statistics for the Montana Tech campus for the years 2009, 2010 and 2011.

TABLE 4.9-1 MONTANA TECH CRIME STATISTICS					
Year	**2009**	**2010**	**2011**	**2010**	**2011**
Total Crime Offences	**North Campus**			**Highlands College**	
Murder/Non-negligent manslaughter	0	0	0	0	0
Negligent manslaughter	0	0	0	0	0
Sex offenses - Forcible	1	0	0	0	0
Sex offenses - Non-forcible	0	0	1	0	0
Robbery	0	0	0	0	0
Aggravated assault	0	0	0	0	0
Burglary	0	0	0	0	0
Motor vehicle theft	0	1	0	0	0
Arson	0	0	0	0	0
Occurrences of Hate Crimes	**North Campus**			**Highlands College**	
Murder/Non-negligent manslaughter	0	0	0	0	0
Negligent manslaughter	0	0	0	0	0
Sex offenses - Forcible	0	0	0	0	0
Sex offenses - Non-forcible	0	0	0	0	0
Robbery	0	0	0	0	0
Aggravated assault	0	0	0	0	0
Burglary	0	0	0	0	0
Motor vehicle theft	0	0	0	0	0
Arson	0	0	0	0	0
Number of Arrests	**North Campus**			**Highlands College**	
Illegal weapons possession	0	0	0	0	0
Drug law violations	1	0	5	0	0
Liquor Law violations	1	0	0	0	0

Cyber-terrorism is another concern on college campuses. Cyber-terrorism 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.

According to the *Montana Tech Emergency Action and Crisis Protocol Manual* (2012) employees are expected to know how to respond in emergency situations in order to provide assurance of their safety and the safety of students from emergencies. They are expected to know what type of evacuation is necessary and what their role is in carrying out the plan. Employees are expected to be familiar with "lockdown" and "shelter in place" procedures in the event of a sniper or other situation that would warrant staying in place. Montana Tech conducts evacuation drills of every building on campus at least once per year, and "lockdown" and "shelter-in-place" drills when allowed.

Hazard Effects and Vulnerabilities

The origins and targets for terrorism and civil unrest are difficult to predict. Individuals or groups that feel oppressed on any issue can resort to violent acts to inflict harm and damage in an attempt to gain publicity or affect policy. The locations of these attacks can occur anywhere but often the symbols that represent a threat to their cause are often times the target.

Terrorist attacks have the potential to affect structures, infrastructure, and human life. If a large explosion was 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.

Chapter 5 of the Montana Tech *Campus Emergency Action and Crisis Protocol Manual* (2012) provides helpful tips for individuals displaced by Bomb Threats and Terrorist Events or Weapons of Mass Destruction. Chapter 6 of the Plan provides tips for individual non-displacement crises and includes Hostage Situation, Kidnapping, Lockdown Procedures, Physical Assault, Large-Scale Protests, Rape/ Sexual Assault, and Workplace Violence. Montana Tech conducts evacuation drills of every building on campus at least once per year, and “lockdown” and “shelter-in-place” drills when allowed.

Montana Tech currently has a policy of checking student identification for building access after class hours. There are about 50 Safety and Security dial-any-number phones located throughout campus buildings and two outdoor phones in call boxes that are dial-any-number. Most elevators also have security phones that dial security directly. Security services on campus are referenced in *Section 3.6.5*.

Probability and Magnitude

The effects of terrorism can vary significantly from loss of life and injuries to property damage and disruptions in services such as electricity, water supply, public transportation, and communications.

The probability of a terrorist act or civil disturbance at Montana Tech is considered to be unlikely but possible due to the lack of previous events on the campus or in the region. The probability of campus violence is rated as likely (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.

Future Development

Future development on the Montana Tech campus should have little to no impact on the terrorism or violence threat.

4.10 VOLCANIC ERUPTIONS

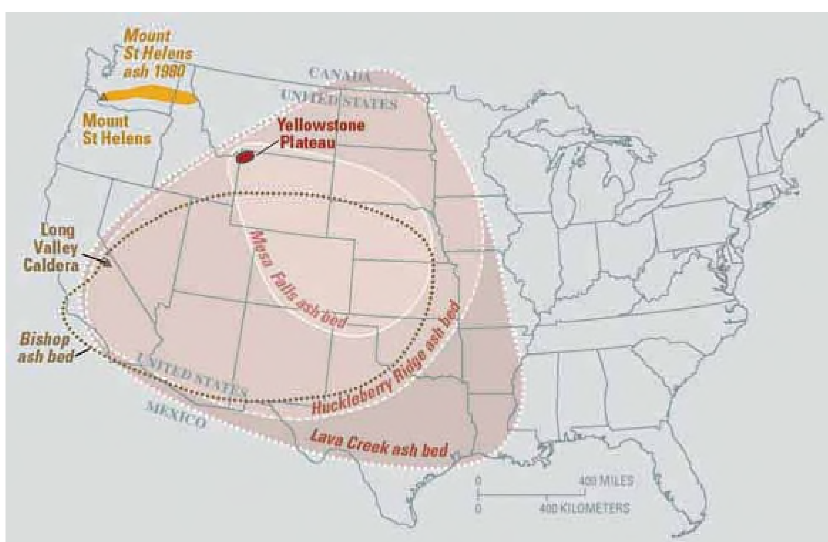
CPRI SCORE = 1.75

Volcanic eruptions are generally not a major concern in Montana due to the relatively low probability (compared with other hazards) of events in any given year. However, Montana is within a region with a significant component of volcanic activity and has experienced the effects of volcanic activity as recently as 1980. On May 18, 1980, Mount St. Helens in western Washington erupted, killing 57 and causing over one billion dollars of damage in the northwest. The eruption followed two months of earthquakes and minor eruptions, and this warning allowed most people in the proximal hazard area to evacuate prior to the eruption. Ashfall from the eruption impacted western Montana, covering roads, affecting crops, machinery and vehicles, and creating health issues. The uncompacted ash was estimated to have been about 1-inch thick in Butte-Silver Bow County. Schools were closed for three days from May 19th to May 21st after the incident.

There are 20 active or potentially-active volcanoes in the United States. The two volcanic centers affecting Montana in recent geologic time are: 1) the Cascade Range of Washington, Oregon and California; and 2) the Yellowstone Caldera in Wyoming and eastern Idaho. Volcanic eruptions in the Cascade Range are more likely to impact Montana than Yellowstone eruptions, based on the historic trends of past eruptions. The primary effect of the Cascade volcanic eruptions on Montana would be ash fall.

The distribution of ash from a violent eruption is a function of the weather, particularly wind direction and speed and atmospheric stability, and the duration of the eruption. As the prevailing wind in the mid-latitudes of the northern hemisphere is generally from the west, ash is usually spread eastward from the volcano. Exceptions to this rule do, however, occur. Ash fall, because of its potential widespread distribution, offers some significant volcanic hazards. **Figure 4-2** shows the distribution of ash from various volcanic eruptions. Butte-Silver Bow County would be located north-northwest of the area shown as Yellowstone Plateau.

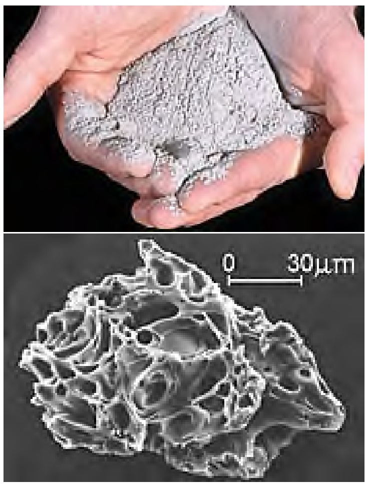
Figure 4-2
Areas of the U.S. Once Covered by Volcanic Ash
Source: USGS, 2005



Hazard Effects and Vulnerabilities

Volcanic ash can cause failure of electronic components, interrupt telephone and radio communications, and cause internal combustion engines to stall. Airborne particles of volcanic ash can pose a health risk to people with respiratory conditions. **Table 4.10-1** describes the effects of volcanic ash.

TABLE 4.10-1
EFFECTS OF VOLCANIC ASH

 Volcanic ash, like this 1980 ash from Mount St. Helens, is made up of tiny jagged particles of rock and glass (photo on bottom; magnified 200 times).	▪ Short-circuits and failure of electronic components, especially high-voltage circuits and transformers (wet ash conducts electricity). ▪ Eruption clouds and ashfall commonly interrupt or prevent telephone and radio communications. ▪ Volcanic ash can cause internal-combustion engines to stall by clogging air filters and also damage the moving parts. Engines of jet aircraft have suddenly failed after flying through clouds of even thinly dispersed ash. ▪ Roads, highways, and airport runways can be made treacherous or impassable because ash is slippery and may reduce visibility to near zero. Cars driving faster than 5 miles per hour on ash-covered roads stir up thick clouds of ash, reducing visibility and causing accidents. ▪ Ash also clogs filters used in air-ventilation systems to the point that airflow often stops completely, causing equipment to overheat. ▪ Crop damage can range from negligible to severe, depending on the thickness of ash, type and maturity of plants, and timing of subsequent rainfall. ▪ Like airborne particles from dust storms, forest fires, and air pollution, volcanic ash poses a health risk, especially to children, the elderly, and people with cardiac or respiratory conditions, such as asthma, chronic bronchitis, and emphysema. Source: USGS, 2003

During the Mount St. Helens eruption in 1980, travel was restricted in Western Montana for over a week because of concerns for public health; the ash was determined to be a physical respiratory irritant but not a toxic substance. The main hazards in Western Montana included reduced visibility (and resulting closed roads and airports), clogging of air filters, and a health risk to children, the elderly, and people with cardiac or respiratory conditions, such as asthma, chronic bronchitis, and emphysema.

Magnitude and Probability

There are no active volcanoes in Butte-Silver Bow County but an eruption hundreds of miles away can cause volcanic ash to be deposited on the Montana Tech campus potentially causing health impacts and property damage.

The Butte-Silver Bow County Hazard Mitigation Plan (**Appendix E**) identifies volcanic activity as a hazard due to volcanic eruptions in the Cascade Range to the west, prevailing winds, and the history of ash fall over the county (Mount St. Helens). The probability of a volcanic event that affects Montana Tech is considered to be unlikely (less than one event every 100 years) due to the minimal number of previous events on the campus or in the region.

Future Development

There are no land use regulations that consider the volcanic ash hazard with regard to new building construction.

4.11 FUTURE DEVELOPMENT

Land use and development trends at Montana Tech include the construction of new buildings to respond to campus needs, and upgrading buildings, infrastructure and critical facilities to better protect life safety, address environmental concerns and minimize property damage from hazard events. The Montana Tech campus is most vulnerable to the following hazards: earthquakes, structure fire, wind-hail, and winter storms-extreme cold. Hazard mitigation will be considered when planning for new construction at Montana Tech to reduce the effects of hazards on new buildings and infrastructure.

Future development at the Montana Tech campus includes:

- 100-bed Residence Hall
- Addition to the Engineering Lab/Classroom Building
- Move the Highlands College to the North Campus which would involve construction of a large building to accommodate those programs.
- Transfer of the University Relations Center to Montana Tech ownership

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 actions were developed for the Montana Tech campus in 2007. A matrix developed for project ranking emphasizing cost-benefit and input from the campus advisory committee was used to determine project priority. A mitigation action plan was developed as part of the 2013 PDM Plan update to capture progress made towards project implementation. It also identified planned activities to accomplish the high priority mitigation projects.

Following 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 this section.

5.1 GOALS, OBJECTIVES, AND PROPOSED ACTIONS

The Plan goals describe the overall direction that Montana Tech 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.

A broad range of potential actions were considered in 2007 when the mitigation strategy was first developed. The 2013 PDM Plan update focused on building on the existing strategy with an emphasis on the high priority projects (**Table 5.3-1)**. A reconciliation of the Montana Tech mitigation strategy between initial develop in 2007 and the 2013 update is presented in **Table 5.3.2.**

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 using the following criteria. Each project was assigned a "high", "medium", or "low" rank for *Population Protected, Property Protected*, *Services Impacted*, *Project Feasibility* and *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 of the campus population would be protected.

- For the ***Property Protected*** category, a "high" means greater 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 of property would be protected.

- The primary "product" provided by universities is the service of education and training. Therefore, continuity of service is a primary asset that mitigation planning needs to address. For the ***Services Impacted*** category, a "high" represents that continuity of campus services would be maintained on greater than 50 percent of the campus by implementation of the mitigation strategy; a "medium" rank represents 20 to 50 percent of campus services would be maintained; and, a "low" rank represents less than 20 percent of the campus services 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; a "medium" rank 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 presented in **Table 5.2-1**:

TABLE 5.2-1
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** presents the Montana Tech mitigation strategy showing project ranking. The PDM Advisory Committee determined project priority based on the need for the project. Project prioritization 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

The Advisory Committee reviewed the projects and assigned a corresponding department responsible for its implementation. Cooperating organizations for project implementation may include campus programs, utility companies, and city or county agencies that are capable of, or responsible for, implementing activities and programs. The Advisory Committee identified a schedule for implementation and potential funding sources. The schedule for implementation included several categories including: "on-going" for projects that are part of the university's emergency management program; "short-term" for projects to be completed within 1-2 years; "mid-term" for projects to be completed within 3-4 years; and "long-term" for projects to be completed in 5 or more years.

Table 5.3-1 presents the 2013 Montana Tech mitigation strategy along with a project implementation schedule. **Table 5.3-2** and the mitigation action plans in **Appendix D** present project implementation details including: progress made since the 2007 PDM Plan was adopted, planned activities for the next five years, completed and deleted mitigation projects, and potential funding sources. Montana Tech's Environmental Health and Safety Director and will be responsible for mitigation project administration.

5.4 POTENTIAL FUNDING SOURCES

Funding for mitigation projects listed in this plan may be available from federal and state programs, appropriations from the university system, in-kind services from local government and non-profit organizations, and/or businesses which hire Montana Tech graduates, alumni organizations and utility companies. Some programs may require Montana Tech to apply through Montana DES, Montana A&E or Butte-Silver Bow County for funding. Potential funding sources are summarized below.

FEMA, Hazard Mitigation Grant Program (HMGP). The HMGP provides grants to States, Tribes, local governments, and private non-profit organizations to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. The HMGP is authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act. HMGP provides 75/25 cost-share funding.
More information: http://www.fema.gov/government/grant/hmgp/

FEMA, Pre-Disaster Mitigation Competitive (PDMC) Grant Program. The PDM program provides funds to states, territories, and local governments, communities, and universities for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event. Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. PDMC grants are to be awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds. PDMC provides 75/25 cost-share funding.

TABLE 5.3-1
MONTANA TECH MITIGATION STRATEGY

Goal	Objective	Project	Hazard(S) Mitigated	High-Medium-Low Score	Numeric Score	Campus Priority	Schedule	Responsible Department
Goal 1: Reduce or Prevent Loss from Earthquake Hazard	Objective 1.1: Prevent and/or Reduce Structural Damage on Campus	1.1.1 Conduct seismic evaluation of all buildings on campus.	Earthquake	High	23	High	Ongoing	Facilities
		1.1.2 Install seismic retrofits on Main Hall, Engineering Hall, Museum building and others as needed.	Earthquake	Medium	17	Medium	Long-term	Facilities
		1.1.3 Conduct seismic evaluation of utility tunnels which distribute fiber optic, water, telephone, electrical and steam to campus buildings.	Earthquake	High	25	High	Short-term	Facilities
	Objective 1.2: Protect Students and Building Contents through Implementation of Non-Structural Mitigation Projects	1.2.1 Consider non-structural mitigation projects for chemical storage areas. Evaluate labs for secure shelving.	Earthquake	Medium	21	Medium	Ongoing	Environmental Health & Safety
		1.2.2 Identify non-structural mitigation projects within all campus buildings. Evaluate offices, departmental libraries for secure shelving.	Earthquake	High	25	High	Ongoing	Environmental Health & Safety
	Objective 1.3: Protect Students through Earthquake Awareness	1.3.1 Provide earthquake awareness materials to students.	Earthquake	Medium	17	Medium	Short-term	Environmental Health & Safety
Goal 2: Reduce or Prevent Losses from Structure Fire Associated with Earthquake Hazard	Objective 2.1: Reduce Risk of Natural Gas Caused Fires	2.1.1 Install seismic shut-off valves on natural gas lines to buildings and laboratories.	Structure Fire, Earthquake, Utility Interruption	Medium	21	Medium	Ongoing to Mid-term	Facilities
		2.1.2 Install central shut-off for all natural gas on campus.	Structure Fire, Earthquake, Utility Interruption	High	25	High	Ongoing to Mid-term	Facilities
	Objective 2.2: Reduce Loss of Human Life and Building Contents from Structure Fire	2.2.1 Evaluate campus buildings for compliance with fire codes.	Structure Fire, Earthquakes	High	25	High	Short-term	Environmental Health & Safety
		2.2.2 Install fire suppression system in Museum, Library, and other campus buildings not currently protected.	Structure Fire, Earthquakes	Medium	21	Medium	Long-term	Facilities
Goal 3: Protect Campus Records from Losses Associated with All Hazards	Objective 3.1: Prevent Loss of Paper and Digital Records	3.1.1 Implement off-site storage for hard-copy records.	All Hazards	Medium	21	Medium	Long-term	Facilities
		3.1.2 Implement off-site storage for back-ups of digital records.	All Hazards	Medium	21	High	Short-term	Network Services
		3.1.3 Establish protocol for cyber security to prevent theft of sensitive student information and intellectual property.	Terrorism	Medium	21	High	Ongoing to Long-term	Network Services

TABLE 5.3-1
MONTANA TECH MITIGATION STRATEGY

Goal	Objective	Project	Hazard(S) Mitigated	High-Medium-Low Score	Numeric Score	Campus Priority	Schedule	Responsible Department
Goal 3: Protect Campus Records from Losses Associated with All Hazards	Objective 3.1: Prevent Loss of Paper and Digital Records	3.1.4 Establish fiber redundant loop to protect electronic delivery of campus records.	All Hazards	Medium	21	High	Long-term	Network Services
Goal 4: Reduce Vulnerabilities of Campus Buildings and Utilities from Severe Weather and Earthquake Hazard	Objective 4.1: Reduce Impacts from Power Outages	4.1.1 Negotiate with NorthWestern Energy to develop redundant power feed to campus to mitigate frequent power outages. Consider loop feed from alternate substation.	All Hazards	Medium	21	Medium	Long-term	Facilities, NorthWestern Energy
		4.1.2 Request that NorthWestern Energy remove power lines on campus that are obsolete.	All Hazards	Low	13	Low	Long-term	Facilities
Goal 5: Implement Mitigation Strategies to Enhance Campus Disaster Preparedness	Objective 5.1: Implement Projects to Maintain Continuity of Operations	5.1.1 Create a GIS layer of campus utilities and tie into City system.	Utility Interruption	Medium	19	Medium	Short-term	Tele-communications
		5.1.2 Install efficient cooling system for data and communications systems.	All Hazards	High	23	High	Short-term	Tele-communications
		5.1.3 Obtain emergency generator for campus demark in Centennial Hall and MBMG server room in Natural Resource Building	All Hazards	Medium	21	High	Mid- term	Tele-communications
		5.1.4 Develop resiliency in communications and data systems.	All Hazards	Medium	21	Medium	Long-term	Network Services
		5.1.5 Evaluate biohazards on campus.	All Hazards	Low	15	Medium	Ongoing	Environmental Health & Safety
	Objective 5.2: Conduct Planning/Training Activities to Enhance Preparedness	5.2.1 Develop University-wide business continuity plan to include post-disaster recovery plan.	All Hazards	Medium	21	Medium	Long-term	Environmental Health & Safety
		5.2.3 Provide CERT training for campus staff.	All Hazards	Low	13	Low	Mid- term	Environmental Health & Safety
		5.2.4 Update the campus Emergency Action & Crisis Protocol Manual	All Hazards	High	25	High	Short-term	Environmental Health & Safety
		5.2.5 Establish coordination protocol between Montana Tech campus and Butte-Silver Bow Sheriff's and Fire Departments	All Hazards	High	21	High	Short-term	Environmental Health & Safety

TABLE 5.3-1
MONTANA TECH MITIGATION STRATEGY

Goal	Objective	Project	Hazard(S) Mitigated	High-Medium-Low Score	Numeric Score	Campus Priority	Schedule	Responsible Department
Goal 6: Protect Assets, Collections, and Building Contents from All Hazards	Objective 6.1: Easily Identify Locations and Determine Values of Campus Assets	6.1.1 Inventory and create database of location and values of campus assets including but not limited to computer labs, communications equipment, artwork, museum collections, and special lab equipment.	All Hazards	Medium	17	Medium	Mid- term	Purchasing
		6.1.2 Establish number system for all rooms and mark room numbers on doors.	All Hazards	Medium	17	High	Short-term	Facilities
Goal 7: Enhance Campus Awareness on Hazard Mitigation	Objective 7.1: Provide Public Outreach on All Hazards	7.1.1 Provide students with hazard awareness materials during orientation.	All Hazards	Medium	17	Medium	Ongoing	Environmental Health & Safety
		7.1.2 Conduct drills and exercises and promote hazards awareness in public places on campus.	All Hazards	Medium	17	Medium	Ongoing	Environmental Health & Safety
		7.1.3 Provide outreach to faculty and staff for reducing risk in their personal spaces.	All Hazards	Medium	21	Medium	Ongoing	Environmental Health & Safety

TABLE 5.3-2
MONTANA TECH MITIGATION STRATEGY – PROJECT STATUS AND RECONCILIATION

Hazard	Mitigation Action/Project	Status	Progress Made	Planned Activities	Funding Sources
Earthquake	1.1.1 Conduct seismic evaluation of all buildings on campus.	Ongoing	Dept. Admin A&E performed Tier 1 seismic evaluations on 13 buildings on main and Highlands College. Tier 2 evaluation conducted on Main Hall.	Conduct Tier 1 assessments on other campus buildings. Implement recommendations from Tier 1 evaluations under Project 1.1.2.	FEMA Earthquake Hazard Grant
Earthquake	1.1.2 Install seismic retrofits on Main Hall, Engineering Hall, Museum building, and others as needed.	Not yet implemented	No progress to report	Review recommendations in Tier 1 and Tier 2 evaluations and determine which buildings need retrofits. Prepare FEMA benefit-cost analysis and determine whether FEMA is a funding option. Submit grant.	MUS Appropriation, FEMA
Earthquake	1.1.3 Conduct seismic evaluation of utility tunnels which distribute fiber optic, water, telephone, electrical and steam to campus buildings.	Not yet implemented	No progress to report	Request quote from structural engineering firm to complete seismic evaluation of tunnels. Secure funding. Hire contractor.	Montana Tech Operating Budget, MUS Appropriation
Earthquake	1.2.1 Consider non-structural mitigation projects for chemical storage areas. Evaluate labs for secure shelving.	Partially complete	All laboratories have been evaluated with lips placed on shelves and shelving secured.	Review recommendations in Tier 1 seismic reports. Evaluate rest of chemical storage areas.	Montana Tech Operating Budget, FEMA
Earthquake	1.2.2 Identify non-structural mitigation projects within campus buildings. Evaluate offices, departmental libraries for secure shelving.	Partially complete	Main library has been evaluated and needs work.	Evaluate departmental libraries. Review recommendations in Tier 1 seismic reports.	Montana Tech Operating Budget, FEMA
Earthquake	Install safety glass in all new buildings and install shatterproof film on windows of existing buildings.	Delete	Montana A&E indicated that safety glass is only used where required by code such as near entrances or close to floor. It's primarily an impact issue and not appropriate as earthquake mitigation. New buildings were not constructed with safety glass except as noted above. MT Tech is not interested in pursuing this project.		
Earthquake	1.3.1 Provide earthquake awareness materials to students.	Not yet implemented	Participate in the Rocky Mountain ShakeOut earthquake awareness outreach effort. Distribute brochures on this event and post-earthquake awareness info on MT Tech website.	Continue as stated under *Progress Made*	Montana Tech operating budget
Structure Fire, Earthquake, Utility Interruption	2.1.1 Install seismic shut-off valves on natural gas lines to buildings and laboratories.	Not yet implemented	A new gas feed is being installed to campus during 2013. All utilities on campus are being mapped as of summer 2013. It was determined that ELCB, NRB, and HYPER all have separate gas feeds with flexible piping and shut-off valves.	Complete utility mapping project. If no shut-off valves are found they will be installed.	MUS Appropriation, FEMA, NorthWestern Energy
Structure Fire, Earthquake, Utility Interruption	2.1.2 Install central shut-off for all natural gas on campus.	Not yet implemented	A new gas feed is being installed to campus during 2013. All utilities on campus are being mapped as of summer 2013.	Complete utility mapping project. If no central shut-off valve is found one will be installed.	MUS Appropriation, FEMA, NorthWestern Energy
Structure Fire, Earthquake	2.2.1 Evaluate campus buildings for compliance with fire codes.	Not yet implemented	No progress made. There have been no fire inspections for at least 12 years.	Request Butte-Silver Bow Fire Department and/or Fire Marshall to conduct compliance inspections. Review and implement recommendations.	Butte-Silver Bow County

TABLE 5.3-2
MONTANA TECH MITIGATION STRATEGY – PROJECT STATUS AND RECONCILIATION

Hazard	Mitigation Action/Project	Status	Progress Made	Planned Activities	Funding Sources
Structure Fire, Earthquake	2.2.2 Install fire suppression system in Museum, Library, and other campus buildings not currently protected.	Not yet implemented	No progress to report	Campus leadership needs to re-visit this and determine the likelihood of funding. Consult with experts on appropriate systems and obtain quotes. Submit funding request.	MUS Appropriation
Structure Fire, Earthquake	2.2.3 Consider alternate fire suppression for data and communications systems.	Complete	In 2006, an automatic fire suppression/detection system was installed to protect data and communications system (HFC-125).	None	Montana Tech operating budget
All Hazards	3.1.1 Implement off-site storage for hard-copy administrative records.	Very long-term implementation	No progress to report	Good idea but no immediate plans to implement.	MUS Appropriation, Montana Tech operating budget
All Hazards	3.1.2 Implement off-site storage for back-ups of digital records.	Not yet implemented	Montana Tech has been working with UM-Missoula to establish a file exchange protocol for digital records which will provide a recovery capability. MBMG received funding from the State to scan their paper archive of important records.	Continue working with UM-Missoula. MBMG will complete scanning of paper records.	MUS Appropriation, Montana Tech operating budget
Terrorism & Violence	3.1.3 Establish protocol for cyber security to prevent theft of sensitive student information and intellectual property.	New project for 2013	N/A	Investigate software for data loss protection and develop cost proposal. Implement administrative controls such as scanning system to reduce people who have social security numbers on their computers and eliminate. Keep sensitive data only on central computer.	Montana Tech operating budget
All Hazards	3.1.4 Establish fiber redundant loop to protect electronic delivery of campus records.	New project for 2013	N/A	Document and map infrastructure and determine where fiber should go to establish a redundant loop.	MUS Appropriation, Montana Tech operating budget
Utility Interruption	4.1.1 Negotiate with NorthWestern Energy to develop redundant power feed to campus to mitigate frequent power outages. Consider loop feed from alternate substation.	Partially complete	Data Center now has redundant power feed from a generator. Requested funding in Long Range Building Plan. Sent NorthWestern Energy photos.	Request that NorthWestern Energy add this to their upgrade plans for Butte-Silver Bow.	MUS Appropriation, NorthWestern Energy
All Hazards	4.1.2 Request that NorthWestern Energy remove power lines on campus that are obsolete.	Not yet implemented	No progress to report	Request that NorthWestern Energy remove the overhead power lines by Prospector Hall.	MUS Appropriation,, NorthWestern Energy
All Hazards	5.1.1 Create a GIS layer of campus utilities and tie into City system.	Not yet implemented	All utilities on campus are being mapped as of summer 2013. Completed GIS layers include network, telecom, and natural gas.	Complete utility mapping project to include water and sewer. Submit data to Butte-Silver Bow to incorporate into their GIS.	Montana Tech operating budget, Butte-Silver Bow in-kind
All Hazards	5.1.2 Install efficient cooling system for data and communications systems.	Partially complete	Data Center has been done.	Request bid from refrigeration engineer for chiller with closed loop system. Secure funding and implement system.	MUS Appropriation, Montana Tech operating budget

TABLE 5.3-2
MONTANA TECH MITIGATION STRATEGY – PROJECT STATUS AND RECONCILIATION

Hazard	Mitigation Action/Project	Status	Progress Made	Planned Activities	Funding Sources
All Hazards	5.1.3 Obtain emergency generator for campus demark in Centennial Hall and MBMG server room in Natural Resource Building.	Partially complete	New Natural Resources building and Data Center have generators.	Work with electrical engineer to design plan to tie in MBMG server. Get approval from BTLR&R to spend funding for demark generator. Have electrical engineer prepare design and bid out project.	MUS Appropriation, Montana Tech operating budget
All Hazards	5.1.4 Develop resiliency in communications and data systems.	Needs implementation University-system wide.	Cell phones are emphasis now. Data Center has virtualized images that are put onto another server.	Participate in developing design for entire University system.	MUS Appropriation, Montana Tech operating budget
All Hazards	5.1.5 Evaluate biohazards on campus.	Partially complete	No progress made.	Conduct inventory and re-evaluate labs. Post signs on doors and cabinets.	Montana Tech operating budget
All Hazards	5.2.1 Develop University-wide business continuity plan to include post-disaster recovery plan.	Not yet implemented	No progress to report	Obtain funding and hire contractor. Coordinate project within University system.	Montana Tech operating budget
All Hazards	Develop University-wide post-disaster recovery plan.	Delete	This project has been combined with 5.2.1.		
All Hazards	5.2.2 Develop PDM Plan for Highlands College and family housing.	Complete	Received FEMA planning grant to update Montana Tech PDM Plan.	These facilities will be included in 2013 update of Montana Tech PDM Plan	FEMA
All Hazards	5.2.3 Provide CERT training for campus security personnel.	Not yet implemented	Numerous staff received CERT training about 10 years ago. No progress made to update this training since. Some backpacks are available.	Decide whether campus wants to reinvigorate CERT training and determine who should receive training. Update training for staff previously trained and provide new training to others. Invite Charlie Hanson with MT DES to come to campus and provide training.	Montana Tech operating budget, City/County DES
All Hazards	5.2.4 Update the campus Emergency Action & Crisis Protocol Manual	New project for 2013	N/A	Prepare in-house update of Campus Crisis Manual. Split into two documents one of which to serve as Emergency Operations Plan.	Montana Tech operating budget
All Hazards	5.2.5 Establish coordination protocol between Montana Tech campus and Butte-Silver Bow Sheriff's and Fire Departments	New project for 2013	New project for 2013 PDM Plan update. Provided Sheriff's and Fire Depts. floor plans of all campus buildings.	Meet with Butte-Silver Bow and update written protocol.	Montana Tech operating budget
All Hazards	Inventory important collections for insurance purposes.	Delete	This project has been combined with 6.1.1		
All Hazards	6.1.1 Create database of location and values of campus assets including but not limited to computer labs, communications equipment, artwork, museum collections, and special lab equipment.	Partially complete	Important collections have been inventoried.	Create central database and consolidate departmental asset lists.	Montana Tech operating budget

TABLE 5.3-2
MONTANA TECH MITIGATION STRATEGY – PROJECT STATUS AND RECONCILIATION

Hazard	Mitigation Action/Project	Status	Progress Made	Planned Activities	Funding Sources
All Hazards	6.1.2 Establish number system for all rooms and mark room numbers on doors.	New project for 2013	Room numbers agreed upon.	Complete room numbering for Auxiliary buildings (HYPER, Library, SUB). Bring to Executive Committee and get funding. Develop consistent numbering system. Get signs for doors.	Montana Tech operating budget
All Hazards	Relocate valuable assets to non-vulnerable areas within campus buildings.	Delete	Project is being deleted because implementation isn't feasible.		
All Hazards	Consider "Safe Room" for storage of special archives.	Delete	Project is being deleted because implementation isn't feasible.		
All Hazards	7.1.1 Provide students with hazard awareness materials during orientation.	Ongoing	Hazard awareness outreach is provided to students and parents.	Continue and expand program. Speak to students during orientation.	Montana Tech operating budget
All Hazards	Build displays on hazards for public places on campus.	Ongoing	This project has been combined with 7.1.2		
All Hazards	7.1.2 Conduct drills and exercises and promote hazard awareness in public places on campus.	Ongoing	Drills are conducted annually. Small posters on hazards are displayed in student union.	Go to Executive Committee and discuss need for exercises. Continue and expand hazard outreach program. Participate in Rocky Mountain Shake-out in October.	Montana Tech operating budget
All Hazards	7.1.3 Provide outreach to faculty and staff for reducing risk in their personal spaces.	Ongoing	Emails sent by EHS to faculty and staff on this topic.	Continue and expand effort. Send e-mails and make posters.	Montana Tech operating budget

More information: http://www.fema.gov/government/grant/pdm/index.shtm

U.S. Department of Homeland Security. Enhances the ability of states, and local jurisdictions, and other regional authorities in the preparation, prevention, and response to terrorist attacks and other disasters, by distributing grant funds. Localities can use grants for planning, equipment, training and exercise needs. These grants include, but are not limited to areas of Critical Infrastructure Protection Equipment and Training for First Responders, and Homeland Security Grants. More information:
http://www.dhs.gov/dhspublic/

Hazardous Materials Emergency Preparedness Grants. Grant funds will be passed through to local emergency management offices and HazMat teams having functional and active LEPC groups. More information: http://www.phmsa.dot.gov/hazmat/grants

5.4 LEGAL FRAMEWORK

A number of federal, state and local regulations, policies and plans form the legal framework available to implement Montana Tech hazard mitigation goals and projects.

Federal

- 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

State of Montana

- Montana Code Annotated, Title 10, Chapter 3, Disaster and Emergency Services
- Montana Code Annotated, Title 50, Chapter 60, Building Construction Standards

Butte-Silver Bow City County

- Butte Silver Bow City/County, Montana Hazard Mitigation Plan
- Butte-Silver Bow Municipal Code

Montana Tech of the University of Montana

- Strategic Plan
- Long Range Building Plan
- Capital Equipment Plan
- Emergency Action & Crisis Protocol Manual
- Montana Tech Safety Policy
- Montana Tech Safety Committee
- Pandemic Plan

- Chemical Hygiene Plan
- Radiation Safety Plan
- Hazard Communication Program –OSHA
- Job Descriptions for Environmental Health and Safety position

6.0 CAPABILITY ASSESSMENT

Montana Tech's capabilities to implement mitigation projects include planners, engineers, scientists, GIS personnel, and financial and administrative professionals, both within Montana Tech and associated with state and local partners. These resources collectively have the responsibility to maintain Montana Tech as a disaster-resistant university. The goals and objectives used to mitigate natural and technological hazards builds on the campus' existing capabilities.

6.1 MONTANA TECH

Montana Tech's in-house capability to implement mitigation projects includes several entities including the Office of Environmental Health and Safety, the Safety Committee, and the Physical Facilities Department. A description of each follows.

6.1.1 Office of Environmental Health and Safety

The Office of Environmental Health and Safety is responsible for ensuring safety of students, employees and property on campus by developing and maintaining safety manuals, Occupational Health and Safety Administration (OSHA) plans, emergency action plans, laboratory safety manuals, hazardous material plans, and bio-hazard plans. The office 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. The Office of Environmental Health and Safety:

- ✓ Plans, organizes and manages the campus emergency preparedness program;
- ✓ Evaluates, improves and promotes comprehensive disaster planning efforts;
- ✓ Organizes and facilitates effective operation of multi-discipline work groups and task forces;
- ✓ Develops and reviews policies pertaining to hazard mitigation; and,
- ✓ Is responsible for mitigation project administration.

These efforts are designed to enhance the capacity of Montana Tech to plan for, respond to, and mitigate the consequences of threats and disasters using an all-hazard framework. The job description of the Director of Environmental Health and Safety also includes:

- Assists in the preparation of written procedures and standards for safe general practices in work and laboratory situations.
- Inspects all campus facilities, including but not limited to, specific operations, lab activities, MBMG activities, and student Residence Halls at regular and adequate intervals.
- Uses emergency action procedures and confers with the appropriate campus departments and regulatory agencies for medical concerns, chemical spills, fires, bomb threats, and power loss in conjunction with other established campus emergency response policies.

- Implements the safety and health training activities required for specific operations and lab work that may produce hazardous situations.
- Actively promotes and is a resource for educational safety training programs for faculty, staff and students.
- Performs recordkeeping for safety programs and issues and performs accident investigations.
- Reports to the Safety Committee and the Personnel Office concerning accident reports and accident investigations.
- Directs Montana Tech's Hazardous Waste Disposal Program.
- Reports significant issues of safety and health and/or noncompliance with the *Safety Policy* to the appropriate Vice Chancellor and/or Chancellor.
- Provides risk assessments, as requested, for ongoing or proposed operations, provides strategies for risk minimization or elimination, and develops cost estimates for implementation of these strategies.

The Office of Environmental Health and Safety has a staff of one with a 15 hour per week student intern position.

6.1.2 Safety Committee

The Montana Tech Safety Committee is appointed by the Vice-Chancellor of Academic Affairs and Research and has much do to with hazard mitigation on campus. According to Administrative Rules of Montana, 24.30.2542-2546, the Safety Committee shall:

- Hold regular meetings as necessary, but meet at least once every four months.
- Assess potential hazards and communicate suggested hazard control information to the campus.
- Inform employees of safety committee activities and recommendations.
- Help motivate employees to create a culture of safety in the workplace.
- Assist in development of safety rules, policies and procedures; control of hazards; periodic evaluation of the safety program; inspection of the workplace; and development of safety training and awareness topics.
- Coordinate the establishment of campus procedures and standards pertaining to safety, health, and loss control.
- Transmit pertinent safety and health information to the Director of Environmental Health and Safety and to appropriate administrators as required.

6.1.3 Department of Physical Facilities

The Department of Physical Facilities maintains the infrastructure of the campus and is responsible for maintenance of the grounds and buildings. Physical Facilities also provides the capabilities needed to implement hazard mitigation projects; specifically, those critical to the continuity of functions and services on the Montana Tech campus.

In the event of a disaster or hazard event, Physical Facilities would ensure that the infrastructure of the campus was maintained. In the event of a severe storm or earthquake that left debris behind, Physical Facilities would be responsible for the cleanup. During severe winter events, Physical Facilities is in charge of snow removal on campus. Physical Facilities would be responsible for shutting down a building's HVAC system in the event of a chemical, biological, or accidental toxic release. Physical Facilities is responsible for helping departments secure shelving and other important hazard mitigation activities.

6.2 MONTANA DEPT OF ADMINISTRATION, ARCHITECTURE & ENGINEERING DIVISION

The Montana Department of Administration, Architecture and Engineering Division (A&E) serves and assists the Montana University System in the design and construction of facilities, repairs and alterations of existing facilities, and planning for their needs. The State of Montana has adopted High Performance Design Standards for the construction, renovation, and maintenance of public buildings in the state. These standards have been developed to improve the capacity of the state to design, build, and operate high-performance and resilient buildings. The resiliency factor includes design to mitigate the effect of natural hazards and man-made disasters.

6.3 BUTTE-SILVER BOW COUNTY LOCAL EMERGENCY PLANNING COMMITTEE

The mission of the Butte-Silver Bow County Local Emergency Planning Committee (LEPC) is to provide resources and guidance to the community through education, coordination and assistance in disaster response planning; and to assure public health and safety. They do not function in actual emergency situations, but attempt to identify and catalogue potential hazards, identify available resources, and mitigate hazards when feasible. The LEPC consists of representatives from businesses, local government, emergency responders and citizen groups located in Butte-Silver Bow County, and includes a representative from Montana Tech. Monthly meetings are held.

7.0 PLAN MAINTENANCE PROCEDURES

The Plan maintenance section of this document details the formal process that will ensure that the Montana Tech 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 Montana Tech will integrate public participation throughout the Plan maintenance process. Also included in this section is an explanation of how Montana Tech intends to incorporate the mitigation strategies outlined in this Plan into existing planning mechanisms and policies.

7.1 MONITORING, EVALUATING AND UPDATING THE PLAN

7.1.1 Process Used Over the Past Five Years

The Montana Tech PDM Plan was to be reviewed every two years, or as deemed necessary by knowledge of new hazards, vulnerabilities, or other pertinent reasons. The purpose of the review was to determine whether a Plan update was needed prior to the scheduled five year update, identify new mitigation projects, and/or evaluate the effectiveness of existing policies relating to mitigation. No new hazards or vulnerabilities came up since the Montana Tech PDM Plan was adopted in 2007, no new mitigation projects were deemed necessary, and current policies did not need revision. As such, the Montana Tech PDM Plan was not reviewed or evaluated during the interim.

When Hazard Mitigation Grant Program (HMGP) planning funds became available in 2011 due to a Presidential flood disaster (DR-1996), the chairperson of the Montana Tech PDM Advisory Committee scheduled a meeting of the committee where a decision was made to request funding to update the Plan. A HMGP planning grant application was prepared, submitted and subsequently awarded to Montana Tech to update their PDM Plan. A contractor was hired to facilitate with the planning process over a 12-month period.

The update process involved a kick-off meeting, planning forums, and a public meeting where the Advisory Committee and community stakeholders exchanged ideas on hazard vulnerability and mitigation actions. The draft plan was available for public review on the project website and comments received were integrated into a revised draft document. The revised draft was posted on the project website for final comment and submitted to the Montana State Hazard Mitigation Officer and FEMA for acceptance. Additional comments were addressed in a final version of the Plan that was adopted by the Chancellor of Montana Tech.

7.1.2 Revised Process for Next Plan Update

The PDM Advisory Committee will continue to meet on an as-needed basis to monitor and evaluate the Plan and to determine whether an update is needed sooner than five years. The Committee will discuss progress made towards implementing the high priority mitigation actions and determine whether grants should be prepared to secure mitigation project funding. At least one member of the PDM Advisory Committee will attend FEMA's Benefit-Cost Analysis training, offered by Montana DES, which will help Montana Tech complete competitive grant applications for their eligible high priority projects.

The PDM Advisory Committee chairperson will be responsible for the next five year Plan update. One year prior to the expiration of the current plan, a grant application will be prepared to secure funding through FEMA's HMGP or PDM grant programs. If FEMA funding is unavailable, Montana Tech will update the Plan in-house or university resources will be used. Plan development, review, and adoption will be similar to the process used for the 2013 PDM Plan update.

7.2 IMPLEMENTATION THROUGH EXISTING PROGRAMS

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

The university currently 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; 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 and that high-hazard areas are being considered for low risk uses.

To ensure that the goals of the PDM Plan 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 Environmental Health and Safety Director, as well as various other members of the campus Safety Committee 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.

7.3 CONTINUED PUBLIC INVOLVEMENT

Montana Tech is dedicated to involving the campus population and community stakeholders in review and update of the PDM Plan. The campus population and stakeholders will have many opportunities to provide feedback about the Plan. The Plan will be available on the campus website and a hard copy will available at the library. *Section 2.0* includes the address and the phone number of the PDM Advisory Committee chairperson responsible for keeping track of comments on the Plan.

A public meeting will be held at the start of the five year Plan update to provide the campus population and community stakeholders a forum through which they can express ideas and opinions about the Plan. The PDM Advisory Committee chairperson will be responsible for using campus resources to publicize the public meeting and maintain public involvement through the campus newspaper and website.

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