UNIVERSITY OF MARYLAND, BALTIMORE COUNTY
EMPOWER - COORDINATE - COOPERATE - STANDARDIZE
EMERGENCY MANAGEMENT

2022 Hazard Vulnerability Risk Assessment (HVRA)

Examining the Natural, Accidental, and Intentional Threats to our Community

January 26, 2023

UMBC

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THIS IS A STRATEGIC LEADERSHIP LEVEL DOCUMENT
It informs objectives for operational procedures and program plans

and A PREPAREDNESS COMPONENT of the EM Program
It describes training, preparedness, or prevention activities

i. Overview

The activities in this Hazard Vulnerability Risk Assessment (HVRA) fulfill Emergency Management (EM) Program requirements found in University System of Maryland (USM) policy. See VI–13.00 -- Policy on Campus Emergency Planning, Preparedness, and Response.

This plan is a STRATEGIC level, PREPAREDNESS component of UMBC's EM framework as described in the Base Emergency Operations Plan (EOP). This HVRA is an annual review of the most likely natural, accidental, and intentional sources of harm to the physical safety and security of the UMBC community, campus, and surrounding jurisdictions. For any questions regarding this document, please contact:

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ii. Approvals

University System of Maryland (USM) VI–13.00 -- Policy on Campus Emergency Planning, Preparedness, and Response requires each USM institution to conduct an annual risk assessment. This HVRA follows the Enhanced Threat and Risk Assessment (ETRA) model. Future assessments will follow the Threat and Hazard Identification and Risk Assessment (THIRA) and Stakeholder Preparedness Review (SPR) model described in Department of Homeland Security (DHS) Preparedness Guide (CPG) 201 (May 2018).

Bruce Perry 1/26/2023 | 11:24 AM EST

Bruce Perry, Chief, UMBC Police Department Date

iii. Applicability

This assessment is only applicable to the main UMBC campus and does not apply to other affiliate locations.

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Part 1. Summary

This HVRA examines three (3) elements of natural, accidental, and intentional hazards: 1) our vulnerability to each; 2) the risk of an actual incident; and 3) the impacts of an actual incident. Conclusions are based on a combination of vulnerability assessments (see Part 3) and risk surveys (see part 4). Survey contributors include Subject Matter Experts (SMEs) with EM-related responsibilities, and other community members to include students, faculty, and staff.

A. Purpose and Objectives

The objectives of this HVRA are: 1) support the strategy and framework in our EM Strategic Plan and Base Emergency Operations Plan (EOP); 2) prioritize training, preparedness, and prevention needs; and 3) facilitate the plans and procedures essential for mitigating incident impacts. This HVRA informs EOP Appendix 3, Hazard Mitigation Procedures, Facility Emergency Action Plans (FEAPs), and Emergency Action Procedures (EAPs).

B. Terms and Definitions

The following terms and definitions apply to this document:

Figure 1.1. Terms and Definitions

Term	Definition
Hazard	A potential source of physical harm to the UMBC community, the physical campus as a whole, or unique to a specific facility on campus.
Incident	The actual occurrence of a specific type of hazard.
Risk	The likelihood that an incident may occur.
Impact	The harmful consequences resulting from an incident.
Vulnerability	A weakness that can increase the risk and impacts of an incident.
Natural Hazard	A source of harm in the natural environment not caused by human activity.
Accidental Hazard	A source of harm from human activity and any resulting impacts are unintentional.
Intentional Hazard	A source of harm from deliberate human activity and impacts are intentional.

C. Results

Results illustrate where we must focus training, preparedness, and prevention efforts. 261 total contributors responded to two separate surveys. 63 staff members designated as University SMEs received a survey request; 46 provided responses. 215 others responded to a separate community survey, to include 12 students, 102 faculty, and 101 staff members. Survey results, in combination with vulnerability assessments, determined primary hazards:

1. **Primary Natural Hazard:** **Severe Storm** (tornadoes, high winds, severe thunderstorms, hurricanes, and tropical storms).
2. **Primary Accidental Hazard:** **Utility or Infrastructure Outage** (water, power, heating or cooling systems, elevators, or fire alarm and sprinkler system outages).
3. **Primary Intentional Hazard:** **Crime Against Property** (any form of theft or intentional damage caused to property owned by an individual or owned by the University).

4. **Ratings for Primary Hazards**. This assessment identified primary hazard Risk (R) Values derived from: 1) Vulnerability (V) Ratings; 2) Hazard Values (HZ); 3) Probabilities (P); 4) Human Impacts (HI); 5) Economic Impacts (EI); and 6) Consequence (C) Scores from the number of complete survey responses (N).

Figure 1.2. Combined Ratings for Primary Hazards (based on 261 total respondents)

Combined Ratings For:	Natural (N = 255)	Accidental (N = 246)	Intentional (N = 250)
Primary Hazards:	Severe Storm	Utility Outage	Crime Against Property
Risk (R) = (P + C) / N:	7.20	7.69	7.63
Vulnerability (V):	7	7	8
Hazard Value (HZ):	206.4	218.2	208.6
Probability (P) = V x HZ:	1444.8	1527.4	1668.8
Human Impact (HI):	209.3	208.3	120.7
Economic Impact (EI):	182.5	156.3	118.7
Consequence (C) = HI + EI:	391.8	364.7	239.3

Figure 1.3. SME Ratings for Primary Hazards (based on 46 total respondents)

SME Ratings For:	Natural (N = 46)	Accidental (N = 46)	Intentional (N = 46)
Primary Hazards:	Winter Storm	Utility Outage	Crime Against Property
Risk (R) = (P + C) / N:	7.12	7.44	7.58
Vulnerability (V):	7	7	8
Hazard Value (HZ):	37.0	39.8	39.0
Probability (P) = V x HZ:	259	278.6	312
Human Impact (HI):	36.8	37.3	18.2
Economic Impact (EI):	31.5	26.5	18.7
Consequence (C) = HI + EI:	68.3	63.8	36.8

Figure 1.4. Community Ratings for Primary Hazards (based on 215 total respondents)

Community Ratings For:	Natural (N = 209)	Accidental (N = 200)	Intentional (N = 204)
Primary Hazards:	Severe Storm	Utility Outage	Crime Against Property
Risk (R) = (P + C) / N:	7.22	7.75	7.64
Vulnerability (V):	7	7	8
Hazard Value (HZ):	169.4	178.4	169.6
Probability (P) = V x HZ:	1185.8	1248.8	1356.8
Human Impact (HI):	172.5	171.0	102.5
Economic Impact (EI):	151.0	129.8	100.0
Consequence (C) = HI + EI:	323.5	300.8	202.5

-- End of Part 1 --

Part 2. Discussion

Outcomes from this HVRA indicate how UMBC can prioritize readiness actions towards the hazards that possess the greatest likelihood and impact.

A. Hazard Value (HZ) Results.

HZ is a surveyed measure of risk and asks, "*how likely is it an incident of this hazard will occur on campus?*" This is a measure of respondents' beliefs only and does not include actual vulnerability ratings. See Attachment 2 for HZ values. Overall, Utility or Infrastructure Outage has the highest HZ value. Among all natural, accidental, and intentional hazards, respondents believe this is the most likely to occur on campus.

1. **SME Assessment.** SMEs gave the highest HZ value to Utility or Infrastructure Outage.
2. **Community Assessment.** Community members gave the highest HZ value to Utility or Infrastructure Outage.

B. Impact Results.

There are two surveyed measures of impact severity. Human impact (HI) is asks, "*what percentage of our population would be impacted if an incident of this hazard occurred?*" See Attachment 3 for HI values. Economic Impact (EI) asks, "*what percentage of our economic value would be impacted if an incident of this hazard occurred?*" See Attachment 4 for EI values. Overall, IT or Communications Outage has the highest HI value. Among all natural, accidental, and intentional hazards, respondents believe this would have the greatest human impact. Overall, Severe Storm has the highest EI value. Among all natural, accidental, and intentional hazards, respondents believe this would have the greatest economic impact

1. **SME Assessment.** SMEs gave the highest HI value to IT or Communications Outage and the highest EI value to Severe Storm.
2. **Community Assessment.** Community members also gave assigned the highest HI value to IT or Communications Outage. In contrast to SMEs, community members gave the highest EI value to Disease Outbreak (other than COVID-19).

C. Consequence (C) Scores.

Each hazard receives its C score by adding its HI and EI values. See Attachment 5 for C scores. Overall, IT or Communications Outage has the highest C score. Among all natural, accidental, and intentional hazards, respondents believe this would have the greatest overall impact on campus.

1. **SME Assessment.** SMEs gave the highest C score to IT or Communications Outage.
2. **Community Assessment.** Community members also gave the highest C score to IT or Communications Outage.

D. Probability (P) Scores.

Each hazard receives its P score by multiplying its HZ value and Vulnerability (V) rating (see Part 3). See Attachment 6 for P scores. Overall, Crime Against Property has the highest P score. This measure combines both survey respondents' beliefs and actual vulnerability ratings. We can consider this to be the most likely hazard to occur on campus.

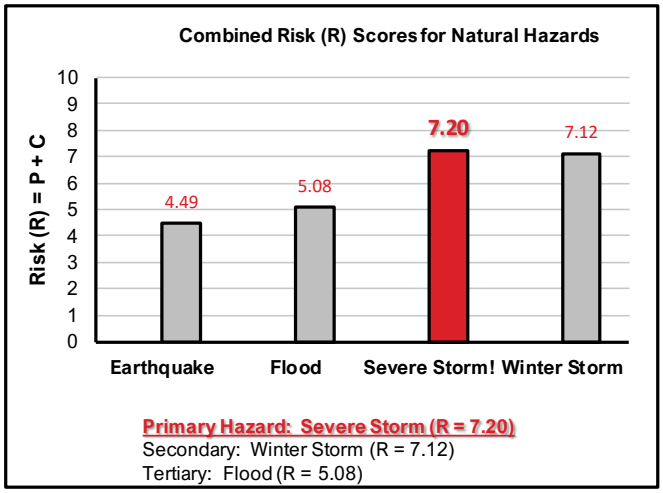
1. **SME Assessment.** SMEs gave the highest P score to Crime Against Property.
2. **Community Assessment.** Community members also gave the highest P score to Crime Against Property.

E. Risk (R) Scores.

Each hazard receives its R score by adding its C and P scores. This total is then divided by the number (N) of survey respondents who answered all questions for that hazard type. See Attachment 6 for more detailed results.

1. **Primary Overall Hazard:** Among all natural, accidental, and intentional hazards, Utility or Infrastructure Outage has the highest overall R score.
2. **Primary Natural Hazard:** Severe Storm has the highest R score among all natural hazards. SMEs gave the highest R score to Winter Storm and other community members gave the highest R score to Severe Storm.
3. **Primary Accidental Hazard:** Utility or Infrastructure Outage has the highest R score among all accidental hazards. SMEs gave the highest R score to Utility or Infrastructure Outage as did other community members.
4. **Primary Intentional Hazard:** Crime Against Property has the highest R score among all intentional hazards. SMEs gave the highest R score to Crime Against Property as did other community members.

Figure 2.1. Combined R Scores for all Natural, Accidental, and Intentional Hazards



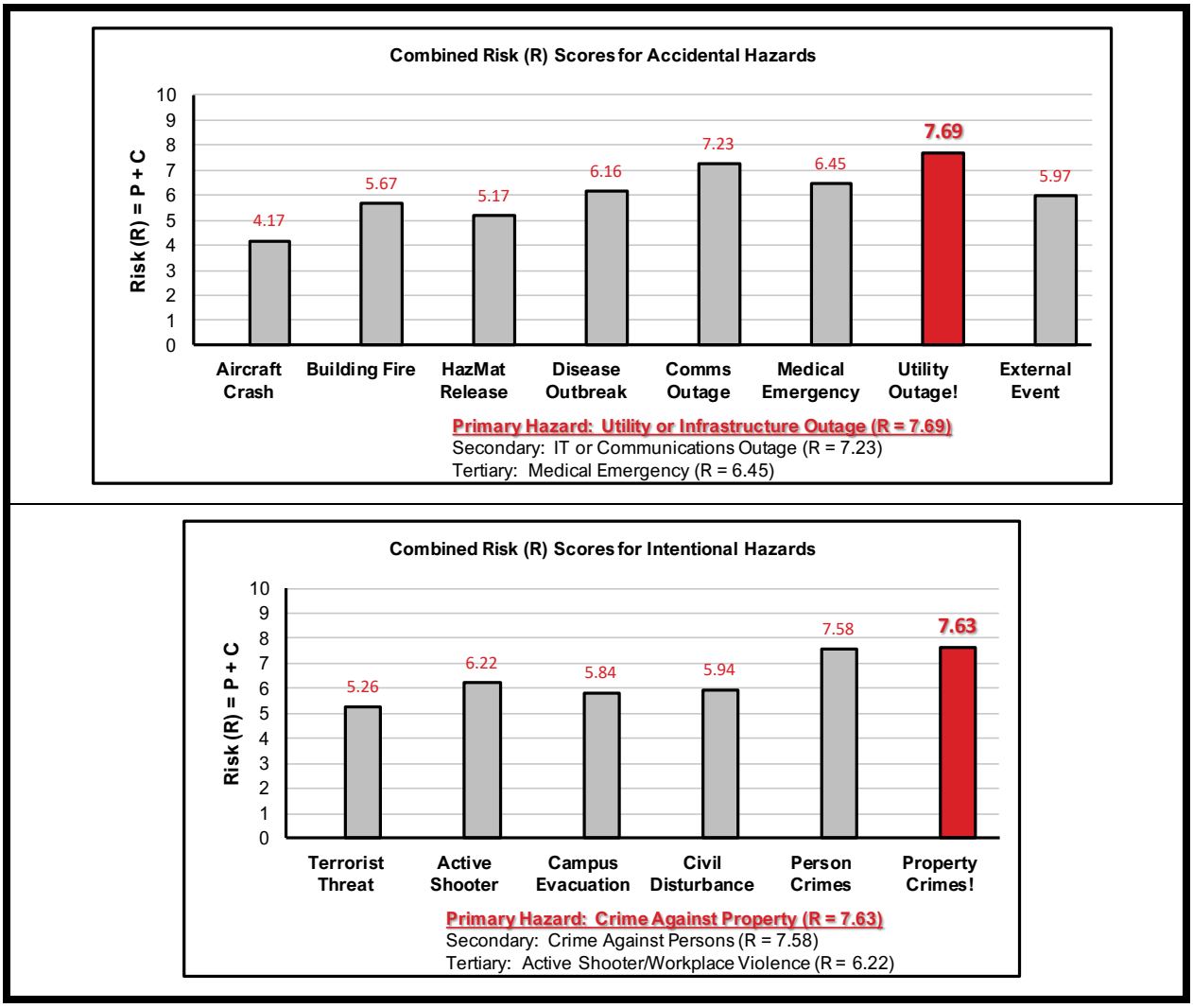
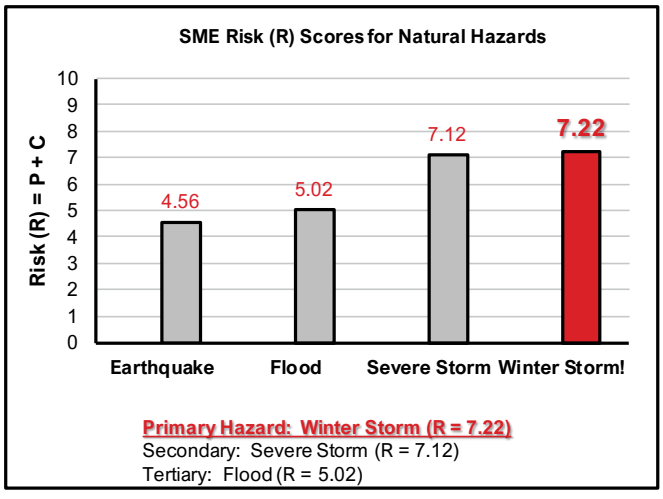


Figure 2.2. SME R Scores for all Natural, Accidental, and Intentional Hazards



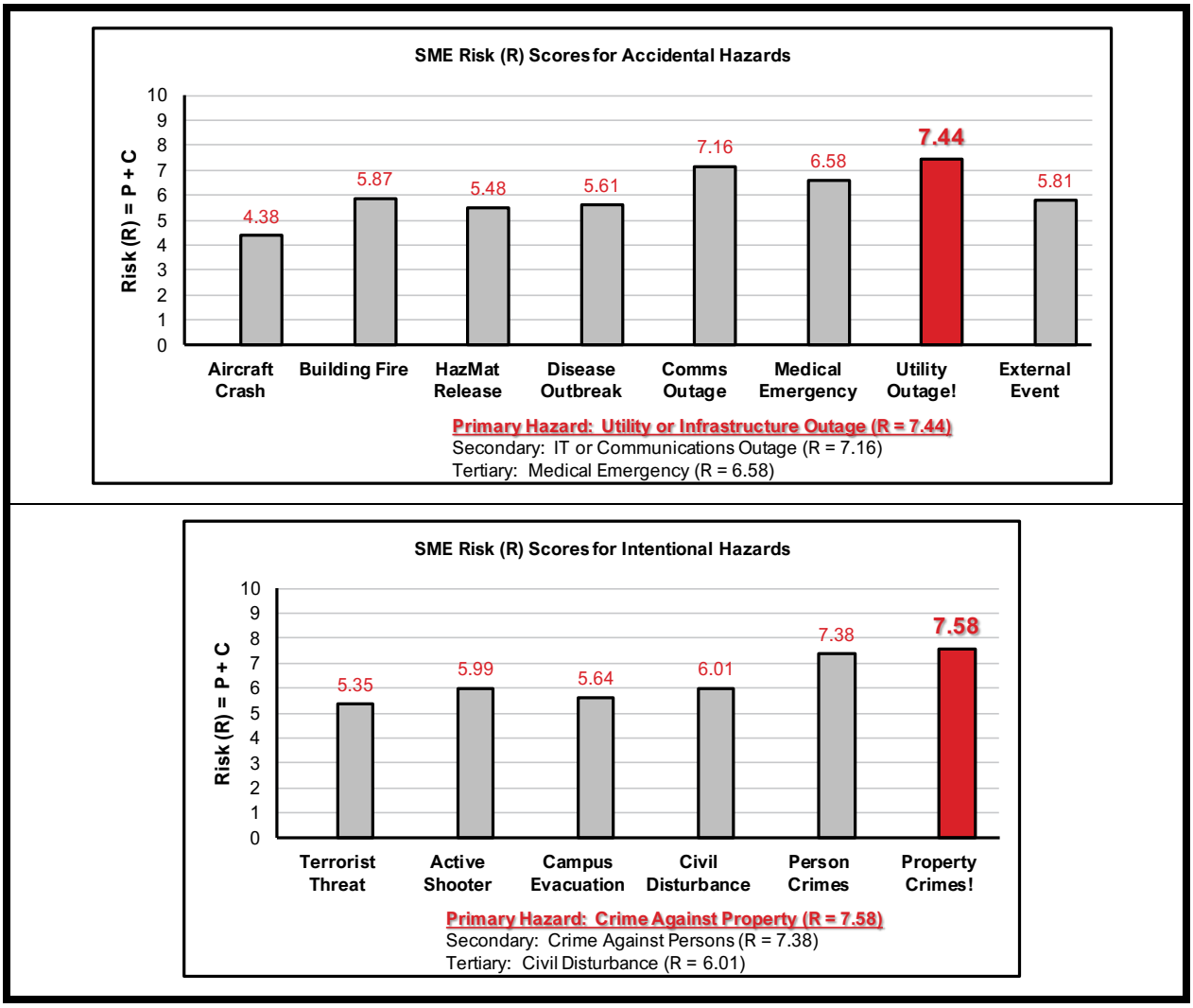
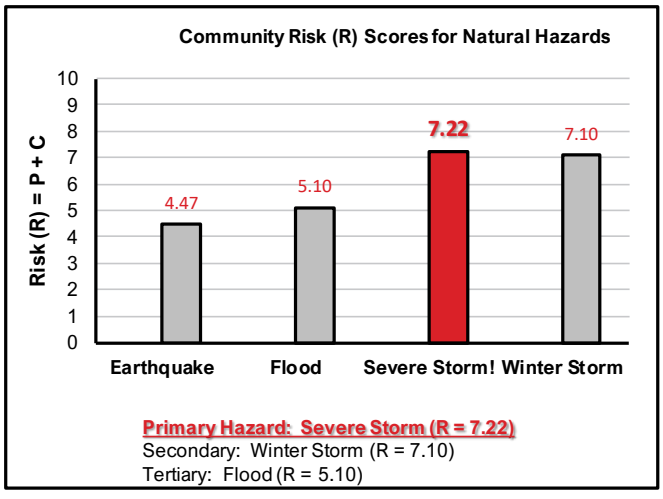
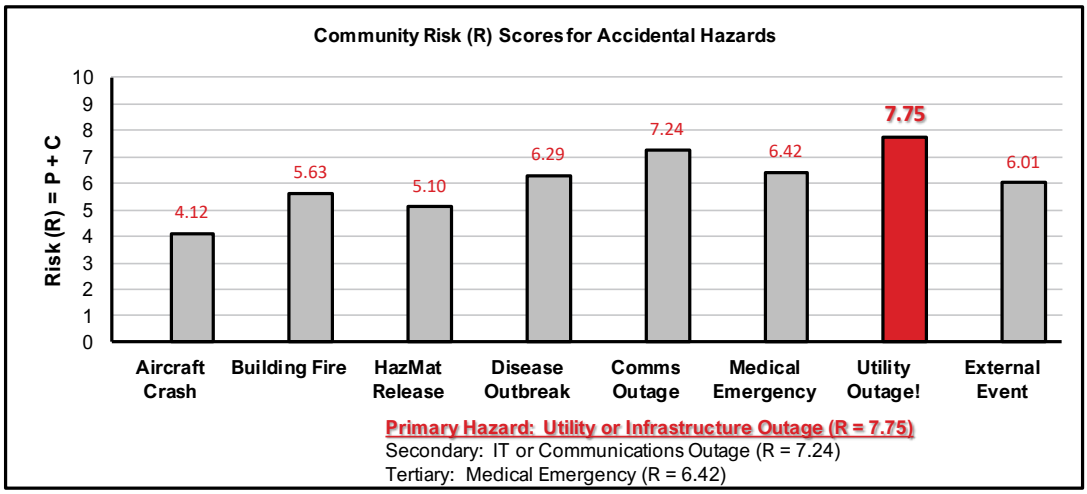
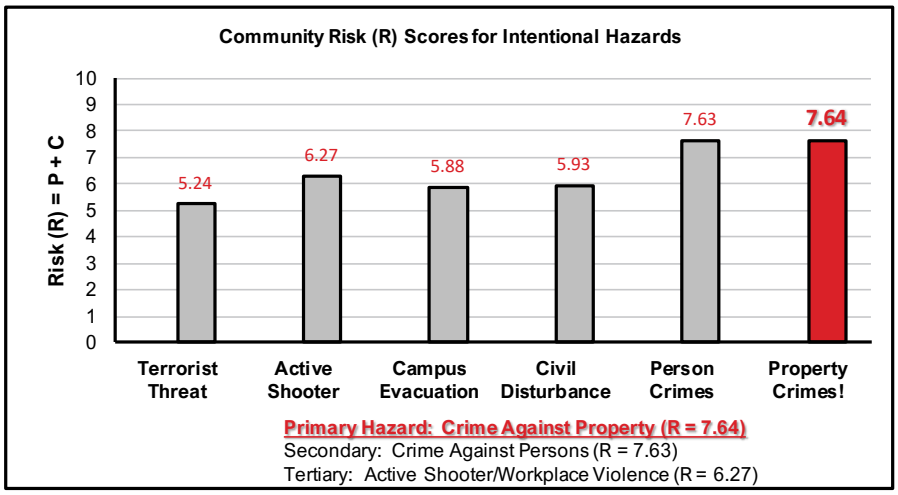


Figure 2.3. Community R Scores for all Natural, Accidental, and Intentional Hazards




Community Risk (R) Scores for Accidental Hazards
Risk (R) = P + C
10
9
8
7
6
5
4
3
2
1
0
4.12
5.63
5.10
6.29
7.24
6.42
7.75
6.01
Aircraft Crash
Building Fire
HazMat Release
Disease Outbreak
Comms Outage
Medical Emergency
Utility Outage!
External Event
Primary Hazard: Utility or Infrastructure Outage (R = 7.75)
Secondary: IT or Communications Outage (R = 7.24)
Tertiary: Medical Emergency (R = 6.42)


Community Risk (R) Scores for Intentional Hazards
Risk (R) = P + C
10
9
8
7
6
5
4
3
2
1
0
5.24
6.27
5.88
5.93
7.63
7.64
Terrorist Threat
Active Shooter
Campus Evacuation
Civil Disturbance
Person Crimes
Property Crimes!
Primary Hazard: Crime Against Property (R = 7.64)
Secondary: Crime Against Persons (R = 7.63)
Tertiary: Active Shooter/Workplace Violence (R = 6.27)

-- End of Part 2 --

Part 3. Vulnerability Assessment

The first step in the HVRA process is to complete Vulnerability Assessment Worksheets (see Attachment 1). These address knowns weaknesses that may increase the risk and impact of each hazard. The first worksheet combines natural and accidental hazards. The second worksheet is for only for intentional hazards. Each worksheet has seven (7) elements. Four (4) core elements are shared and three (3) are category specific. Each has a rating between 0 and 5. Higher ratings mean greater vulnerability. A core group from the UMBC Police Department and Environmental Safety & Health (ESH) completed this assessment.

A. Shared Elements

Both worksheets share four (4) core assessment elements:

1. **Criticality of Site to Jurisdiction**. The usefulness of the site to the local population, economy, or government and if it is essential to jurisdictional continuity.
2. **External Impacts**. Economic/environmental/other impacts on the jurisdiction.
3. **Potential Site Population**. The site's maximum population capacity at any given time.
4. **Potential Collateral Mass Casualties**. The potential number of mass-casualties within a one-mile radius of the site resulting from a catastrophic incident.

B. Natural and Accidental Hazard Elements

There are three (3) assessment elements specific to the natural/accidental hazard worksheet (these are not included in the assessment of intentional hazards):

1. **Geographic Location**. Weather, seismic activity, or other natural vulnerabilities.
2. **Site Preparedness**. Measures taken to prevent or respond to an incident.
3. **Hazardous Materials on Site**. The quantity of material that could be the primary hazard or could complicate incident response if released.

C. Intentional Hazard Elements

There are three (3) assessment elements specific to the intentional hazard worksheet (these are not included in the assessment of natural and accidental hazards):

1. **Level of Visibility**. The general public's awareness of the site.
2. **Potential Threat Element Access**. The ingress and egress availability for an individual or group that may pose a threat to the site.
3. **Potential Target Threat**. The quantity of material that could be the primary hazard, complicate incident response if released, or be the primary target of an attack.

D. Vulnerability (V) Rating

The worksheet calculates a raw score by adding together the ratings of all seven assessment elements. The worksheet converts the raw score to a V rating between 1 and 12. A higher rating indicates greater vulnerability.

-- End of Part 3 --

Part 4. Risk Surveys

The next step in the HVRA process is to survey Subject Matter Experts (SMEs) and members of the general UMBC community (to include students, faculty, and staff). Survey results indicate which hazards they are most concerned about.

A. Online Risk Surveys.

UMBC utilizes two online surveys: one for SMEs and one for general community members. They provide each target group with the same examples of natural, accidental, and intentional hazards, and the same rating options for risk and impacts. The objective of this step is to determine any gaps between what our SMEs "know" and what the general UMBC community "believes." These gaps can then be closed with training, preparedness, and prevention measures. Areas where both groups agree on risk and severity illustrate where we must focus training, preparedness, and prevention efforts.

1. **Surveying SMEs.** The UMBC Subject Matter Expert Risk Survey is coordinated with select staff members considered to have informed, "insider" knowledge of the risks and impacts from potential hazards. Contributors must have functional ownership over response or mitigation capabilities or oversee areas of responsibility that are likely to be impacted by an incident. The survey collects respondents' Email address and requires them to select their work Division from a provided list. Survey responses are collected using an online spreadsheet.
2. **Surveying Community Members.** The UMBC Community Risk Survey is coordinated with the Staff, Faculty, and Student Senates to maximize participation from the entire campus community. Contributors do not need any special knowledge to answer this survey; it simply requests individual opinions. This survey is anonymous and only requires respondents to indicate if they are faculty, staff, or students. Survey responses are also collected using an online spreadsheet
3. **Descriptions and instructions.** Both surveys have identical definitions for "hazard," "risk," and "impact" as stated in the table below:

Figure 4.1. Survey Definitions

Term	Definition
Hazard	For the purpose of this survey, a hazard is a potential source of harm. There are three (3) categories of hazards we want to ask you about: 1) Natural Hazards; 2) Accidental Hazards; and 3) Intentional Hazards. We'll give you an explanation of each category as you go through the survey.
Risk	For the purpose of this survey, risk means how likely you think it is that a specific hazard may occur on campus. For the purpose of this survey, this means the likelihood that an incident will occur on campus. You will be asked to rate this on a scale of 0 to 10. A higher rating means greater likelihood of occurrence.
Impact	For the purpose of this survey, impact means how serious you think the consequences would be if a specific hazard were to occur on campus. You'll be asked to rate the human and economic impacts of specific hazards on a scale of 0 to 5: 0 means no impact, 1 means impacts are not very serious; and 5 means impacts are very serious.

4. **Rating Risk.** For each hazard type, both surveys ask, *"how likely is it this will occur on campus?"* Respondents rate risk for each hazard type by selecting a rating between 0 and 10 (0 = will not occur, 10 = certain to occur).

5. **Rating Impact.** For each hazard type, both surveys assess human Impact and economic impact (see the table below for each assessment question). Respondents rate human and economic impact for each hazard type by selecting a rating between 0 and 5 (0 = No impact, 1 – less than 1%, 2 = less than 10%, 3 = less than 25%, 4 = less than 50%, and 5 = 50% or more).

Figure 4.2. Impact Assessments

Impact Type	Assessment Question
Human Impact	What percentage of the University population would be impacted if this occurred?
Economic Impact	What percentage of the University's economic value would be impacted if this occurred?

B. Hazard Questions.

Both surveys address the same set of natural, accidental, and intentional hazards.

1. **Natural Hazards.** These are sources of harm in the natural environment not caused by human activity. The survey addresses four (4) types of hazards: 1) earthquakes; 2) floods; 3) severe storms; and 4) winter storms.

2. **Accidental Hazards.** These are sources of harm from human activity and any resulting impacts are unintentional. The survey addresses eight (8) types of hazards: 1) an aircraft crash (given our proximity to an airport); 2) a fire emergency (occurring inside a building); 3) an accidental release of hazardous materials; 4) an infectious disease outbreak (other than COVID-19); 5) IT or communications outages; 6) medical emergencies; 7) a utility or infrastructure outage (water, power, heating or cooling systems, elevators, or fire alarm and sprinkler system outages); and 8) other external events (events initiated by an agency or organization outside of UMBC, e.g. activation of a FEMA shelter on campus, a search for a patient missing from a local hospital, or diversion of traffic through campus due to an accident on a nearby highway).

3. **Intentional Hazards.** These are sources of harm from deliberate human activity and impacts are intentional. The survey addresses six (6) types: 1) terrorist threats; 2) an active shooter or workplace violence; 3) a campus evacuation (resulting from a bomb or explosive threat); 4) civil disturbances (riots or violent protests); 5) crimes against persons (any form of assault on an individual or group); and 6) crimes against property (any form of theft or intentional damage caused to property owned by an individual or owned by the University).

-- End of Part 4 --

Part 5. Scoring

Risk and impact receive weighted scores using the following method:

A. Survey Scores

Results from the SME survey are stated in Attachment 2 and results from the community survey are stated in Attachment 3. Results are grouped by three (3) distinct scores:

1. **Hazard Value (HZ):** This is the overall rating given the question "*how likely is it this (hazard) will occur on campus?*" A value for each specific hazard is determined by multiplying the number of survey respondents who selected a specific likelihood for that hazard by the weighted value of that likelihood. "10 (Will occur)" has a weighted value of 5. "7 – 9 (Likely to occur)" has a weighted value of 4. "4 – 6 (Might occur)" has a weighted value of 3. "1 – 3 (Unlikely to occur)" has a weighted value of 2. "0 (Will not occur)" has a weighted value of 1. All weighted values are added and the total is divided by the five (5) score groups for a weighted average. The hazard in each of the categories with the highest weighted average carries the highest perceived risk, or Hazard Value, in its category among the survey respondents

Figure 5.1. HZ Calculation Example

- Two (2) respondents indicate their belief that an earthquake "*will occur*" on campus (a 10 on the survey risk scale). **Their weighted HZ Value for that hazard is 5 x 2 = 10.**
- Seven (7) respondents indicate their belief that an earthquake is "*likely to occur*" (by selecting 7, 8, or 9 on the survey risk scale). **Their weighted value is 7 x 4 = 28.**
- 20 indicate "*might occur*." **Their weighted HZ Value is 20 x 3 = 60.**
- 89 indicate "*unlikely to occur*." **Their weighted HZ Value is 89 x 2 = 178.**
- 8 indicate "*will not occur*." **Their weighted HZ Value is 8 x 1 = 8.**
- Weighted HZ Values for each group are added and the total is divided by the five (5) score groups to give a weighted average HZ Value of 56.8 for an earthquake.
- **HZ = 10 + 28 + 60 + 178 + 8 = 284/5 = 56.8.**

2. **Human Impact (HI)**. This is the overall rating given the question "*what percentage of the University population would be impacted if this occurred?*" A value for each specific hazard is determined by multiplying the number of survey respondents who selected a degree of impact for that hazard by the weighted value of that impact. "5 (50% or more)" has a weighted value of 6. "4 (Less than 50%)" has a weighted value of 5. "3 (Less than 25%)" has a weighted value of 4. "2 (Less than 10%)" has a weighted value of 3. "1 (Less than 50%)" has a weighted value of 2. "0 (no impact)" has a weighted value of 1. All weighted values are added and the total is divided by the six (6) score groups for a weighted average. The hazard in each of the categories with the highest weighted average carries the highest perceived Human Impact in its category among the survey respondents.

Figure 5.2. HI Calculation Example

- Twenty (20) survey respondents indicate their belief that an earthquake will impact "*50% or more*" of the people on campus (a 5 on the survey impact scale). **Their weighted HI for that hazard is 20 x 6 = 120.**
- Ten (10) indicate an earthquake will impact "*less than 50%*" of the people on campus (a 4 on the survey impact scale). **Their weighted HI for that hazard is 10 x 5 = 50.**
- Twenty-two (22) indicate "*less than 25%*" (**HI = 22 x 4 = 88**).
- Twenty-six (26) indicate "*less than 10%*" (**HI = 26 x 3 = 78**).
- Thirty-nine (39) indicate "*less than 1%*" (**HI = 39 x 2 = 78**).
- Eight (8) indicate "*no impact*" (**HI = 8 x 1 = 8**).
- **HI = 120 + 50 + 88 + 78 + 78 + 8 = 422/6 = 70.3.**

3. **Economic Impact (EI) Value**. This is the overall rating given the question "*what percentage of the University's economic value would be impacted if this occurred?*" Weighted averages for Economic Impact are determined using the same method and values described above for Human Impact. The hazard in each of the categories with the highest weighted average carries the highest perceived Economic Impact in its category among the survey respondents.

B. Assessment Scores.

Each specific hazard type within the natural, accidental, and intentional categories receives a Consequence Score, a Probability Score, and a Risk Value.

1. **Consequence (C) Score.** This score is determined by adding the Human Impact and Economic Impact for each hazard together resulting in a total impact rating for that hazard: C = HI + EI. The Consequence Score indicates the total perceived impact that a hazard incident would have on campus. The highest Consequence Score indicates the hazard with the highest potential impact.

2. **Probability (P) Score.** Probability, in terms of this HVRA, reflect the assessments of those who address knowns weaknesses, combined with the perceptions of those who responded to the surveys. For the purposes of this assessment, a perceived probability score (P) for each hazard is determined by multiplying the Vulnerability Rating (derived from the Vulnerability Assessment Worksheets (see Attachment 1) and the Hazard Value: P = V x HZ.

3. **Risk (R) Score.** Risk is determined by adding the Probability Score and the total Consequence Score: R = P + C. This total is then divided by the total number (N) of respondents who answered all survey questions for that specific hazard (accounting for any who did not provide a response to one of the questions): R = (P + C) / N. This puts all combined, SME, and community R score for each hazard type on the same scale for comparison. The hazard type with the greatest score in each category is determined to be the primary natural, accidental, and intentional hazard. The greatest R score among all hazards represents our primary overall hazard.

-- End of Part 5 --

Attachment 1: Vulnerability Assessment Worksheets

Vulnerability Assessment Worksheet 1: Natural and Accidental Hazards

Assessment Elements	Value
1. Geographic Location: Assess the site's vulnerability to hazardous weather, seismic activity, or other natural hazards. 0 = Will not occur; 1 = Unlikely to occur; 2 = Somewhat possible; 3 = Moderately possible; 4 = Likely to occur/high; 5 = Will occur/extremely high	4
2. Criticality of Site to Jurisdiction: Assess usefulness of the site to the local population, economy, or government and if essential to jurisdictional continuity. 0 = No usefulness; 1 = Minor usefulness; 2 = Moderate usefulness; 3 = Significant usefulness; 4 = Highly useful; 5 = Critical or essential	3
3. External Impacts: Assess economic, environmental, and other impacts. 0 = None; 1 = Very low; 2 = Low; 3 = Medium; 4 = High; 5 = Very high	3
4. Site Preparedness: Assess the measures taken at site to prevent or respond to an incident (plans, organization, equipment, training, exercises = POETE). 0 = Detailed plans exist. Personnel are well organized, equipped, trained, frequently exercised. 1 = Acceptable plans exist. Personnel are organized, equipped, trained, annually exercised. 2 = Plans need details/update. Personnel are organized, equipped, trained, infrequently exercised. 3 = Some plans in place. Some personnel organized, equipped, trained but rarely exercised. 4 = Minimal planning. Minimal personnel organized, equipped, trained but never exercised. 5 = No plans in place. No personnel organized, equipped, trained nor exercised.	1
5. Hazardous Materials on Site: Assess quantities of hazardous material that could be the primary hazard if released or could complicate incident response. 0 = No hazardous materials present. 1 = Moderate quantities, controlled, with positive containment, in secure locations with alarms. 2 = Moderate quantities, controlled with positive containment and with alarms. 3 = Major concentrations with established control features under positive containment with alarms. 4 = Major concentrations with moderate control features and containment. 5 = Major concentrations easily accessible, unprotected, and have no containment.	2
6. Potential Site Population: Maximum population at the site at any given time. 0 = None; 1 = Up to 250; 2 = Between 250 and 5,000; 3 = Between 5,000 and 15,000; 4 = Between 15,000 and 50,000; 5 = Over 50,000	3
7. Potential Collateral Mass Casualties: Within a one-mile radius. 0 = None; 1 = Up to 250; 2 = Between 250 and 5,000; 3 = Between 5,000 and 15,000; 4 = Between 15,000 and 50,000; 5 = Over 50,000	4
Calculate the raw score by adding the value of elements 1 – 7	20
8. Vulnerability (V) Rating: Convert the raw score to a rating: 1 = 0 - 2; 2 = 3 - 5; 3 = 6 - 8; 4 = 9 - 11; 5 = 12 - 14; 6 = 15 - 17; 7 = 18 - 20; 8 = 21 - 23; 9 = 24 - 26; 10 = 27 - 29; 11 = 30 - 32; 12 = 33 - 35	7

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Vulnerability Assessment Worksheet 2: Intentional Hazards

Assessment Elements	Value
1. Level of Visibility: Assess the general public's awareness of the site. 0 = Secret/classified Location 1 = Location not publicized 2 = Location not well known 3 = Location known locally 4 = Location known regionally 5 = Location known nationally	4
2. Criticality of Site to Jurisdiction: Assess usefulness of the site to the local population, economy, or government and if essential to jurisdictional continuity. 0 = No usefulness 1 = Minor usefulness 2 = Moderate usefulness 3 = Significant usefulness 4 = Highly useful 5 = Critical or essential	3
3. External Impacts: Assess economic, environmental, and other impacts. 0 = None 1 = Very low 2 = Low 3 = Medium 4 = High 5 = Very high	3
4. Potential Threat Element Access: Assess availability for ingress and egress. 0 = Security patrol 24/7, fenced, alarmed, CCTV, controlled access requiring prior clearance, designated parking, no authorized parking within 300 feet, protected air/consumable entry. 1 = Security patrolled 24/7, fenced, alarmed, controlled vehicle and personnel access, designated parking, no unauthorized parking within 300 feet, protected air/consumable entry. 2 = Security at main entrance during business hours, fenced, alarmed, controlled visitor access, designated parking, no unauthorized parking within 300 feet, protected air/consumable entry. 3 = Controlled visitor access, alarmed after business hours, designated parking, no unauthorized vehicle parking within 50 feet, protected air/consumable entry. 4 = Open during business hours, locked after business hours, unprotected air/consumable entry. 5 = Unlimited, open access, unprotected air/consumable entry.	4
5. Potential Target Threat: Assess quantities of hazardous material that could be the target of an attack or could complicate incident response. 0 = No hazardous materials present. 1 = Moderate quantities, controlled, with positive containment, in secure locations with alarms. 2 = Moderate quantities, controlled with positive containment and with alarms. 3 = Major concentrations with established control features under positive containment with alarms. 4 = Major concentrations with moderate control features and containment. 5 = Major concentrations easily accessible, unprotected, and have no containment.	2
6. Potential Site Population: Maximum population at the site at any given time. 0 = None 1 = Up to 250 2 = Between 250 and 5,000 3 = Between 5,000 and 15,000 4 = Between 15,000 and 50,000 5 = Over 50,000	3
7. Potential Collateral Mass Casualties: Within a one-mile radius. 0 = None 1 = Up to 250 2 = Between 250 and 5,000 3 = Between 5,000 and 15,000 4 = Between 15,000 and 50,000 5 = Over 50,000	4
Calculate the raw score by adding the value of elements 1 – 7	23
8. Vulnerability (V) Rating: Convert the raw score to a rating: 1 = 0 - 2 2 = 3 - 5 3 = 6 - 8 4 = 9 - 11 5 = 12 - 14 6 = 15 - 17 7 = 18 - 20 8 = 21 - 23 9 = 24 - 26 10 = 27 - 29 11 = 30 - 32 12 = 33 - 35	8

-- End of Attachment 1 --

Attachment 2: Hazard Values (HZ)

The following data tables show combined survey results as well as SME and community survey results for this measure.

Figure A2.1. Hazard Values for Natural Hazards

Combined Survey Responses: Respondents assigned the highest combined HZ to **Winter Storm**.

Scale	Earthquake		Flood		Severe Storm		Winter Storm!	
10 (Will occur)	4	20	6	30	78	390	77	385
7 - 9 (Likely to occur)	16	64	43	172	118	472	117	468
4 - 6 (Might occur)	54	162	77	231	43	129	51	153
1 - 3 (Unlikely to occur)	176	352	121	242	20	40	16	32
0 (Will not occur)	11	11	11	11	1	1	0	0
HZ Value:		121.8		137.2		206.4		207.6

SME Survey Responses: SMEs assigned the highest HZ to **Winter Storm**.

Scale	Earthquake		Flood		Severe Storm		Winter Storm!	
10 (Will occur)	0	0	1	5	12	60	12	60
7 - 9 (Likely to occur)	2	8	9	36	27	108	29	116
4 - 6 (Might occur)	15	45	14	42	3	9	3	9
1 - 3 (Unlikely to occur)	28	56	21	42	4	8	2	4
0 (Will not occur)	1	1	1	1	0	0	0	0
HZ Value:		22.0		25.2		37.0		37.8

Community Survey Responses: Community members assigned the highest HZ to **Winter Storm**.

Scale	Earthquake		Flood		Severe Storm		Winter Storm!	
10 (Will occur)	4	20	5	25	66	330	65	325
7 - 9 (Likely to occur)	14	56	34	136	91	364	88	352
4 - 6 (Might occur)	39	117	63	189	40	120	48	144
1 - 3 (Unlikely to occur)	148	296	100	200	16	32	14	28
0 (Will not occur)	10	10	10	10	1	1	0	0
HZ Value:		99.8		112.0		169.4		169.8

Figure A2.2. Hazard Values for Accidental Hazards

Combined Survey Responses: Respondents assigned the highest combined HZ to **Utility Outage**.

Scale	Aircraft Crash		Building Fire		HazMat Release		Disease Outbreak		Comms Outage		Medical Emergency		Utility Outage!		External Event	
10 (Will occur)	0	0	18	90	10	50	34	170	79	395	89	445	132	660	40	200
7 - 9 (Likely to occur)	9	36	77	308	42	168	72	288	112	448	67	268	73	292	75	300
4 - 6 (Might occur)	34	102	95	285	88	264	82	246	53	159	53	159	36	108	70	210
1 - 3 (Unlikely to occur)	189	378	68	136	113	226	70	140	17	34	47	94	15	30	69	138
0 (Will not occur)	29	29	1	1	5	5	1	1	0	0	1	1	1	1	4	4
HZ Value:		109.0		164.0		142.6		169.0		207.2		193.4		218.2		170.4

SME Survey Responses: SMEs assigned the highest HZ to **Utility Outage**.

Scale	Aircraft Crash		Building Fire		HazMat Release		Disease Outbreak		Comms Outage		Medical Emergency		Utility Outage!		External Event	
10 (Will occur)	0	0	5	25	4	20	3	15	12	60	22	110	24	120	7	35
7 - 9 (Likely to occur)	1	4	16	64	11	44	10	40	24	96	13	52	15	60	17	68
4 - 6 (Might occur)	8	24	16	48	19	57	20	60	7	21	7	21	5	15	11	33
1 - 3 (Unlikely to occur)	35	70	9	18	12	24	13	26	3	6	4	8	2	4	11	22
0 (Will not occur)	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HZ Value:		20.0		31.0		29.0		28.2		36.6		38.2		39.8		31.6

Community Survey Responses: Community members assigned the highest HZ to **Utility Outage**.

Scale	Aircraft Crash		Building Fire		HazMat Release		Disease Outbreak		Comms Outage		Medical Emergency		Utility Outage!		External Event	
10 (Will occur)	0	0	13	65	6	30	31	155	67	335	67	335	108	540	33	165
7 - 9 (Likely to occur)	8	32	61	244	31	124	62	248	88	352	54	216	58	232	58	232
4 - 6 (Might occur)	26	78	79	237	69	207	62	186	46	138	46	138	31	93	59	177
1 - 3 (Unlikely to occur)	154	308	59	118	101	202	57	114	14	28	43	86	13	26	58	116
0 (Will not occur)	27	27	1	1	5	5	1	1	0	0	1	1	1	1	4	4
HZ Value:		89.0		133.0		113.6		140.8		170.6		155.2		178.4		138.8

Figure A2.3. Hazard Values for Intentional Hazards

Combined Survey Responses: Respondents assigned the highest combined HZ to **Property Crimes**.

Scale	Terrorist Threat		Active Shooter		Campus Evacuation		Civil Disturbance		Person Crimes		Property Crimes!	
10 (Will occur)	2	10	15	75	10	50	7	35	104	520	114	570
7 - 9 (Likely to occur)	23	92	68	272	39	156	54	216	73	292	69	276
4 - 6 (Might occur)	59	177	75	225	73	219	85	255	52	156	45	135
1 - 3 (Unlikely to occur)	167	334	101	202	132	264	108	216	30	60	31	62
0 (Will not occur)	9	9	1	1	6	6	5	5	0	0	0	0
HZ Value:		124.4		155.0		139.0		145.4		205.6		208.6

SME Survey Responses: SMEs assigned the highest HZ to **Property Crimes**.

Scale	Terrorist Threat		Active Shooter		Campus Evacuation		Civil Disturbance		Person Crimes		Property Crimes!	
10 (Will occur)	0	0	1	5	1	5	0	0	18	90	22	110
7 - 9 (Likely to occur)	5	20	13	52	6	24	12	48	17	68	16	64
4 - 6 (Might occur)	12	36	14	42	14	42	19	57	7	21	5	15
1 - 3 (Unlikely to occur)	29	58	18	36	24	48	15	30	4	8	3	6
0 (Will not occur)	0	0	0	0	1	1	0	0	0	0	0	0
HZ Value:		22.8		27.0		24.0		27.0		37.4		39.0

Community Survey Responses: Community members assigned the HZ to **Property Crimes**.

Scale	Terrorist Threat		Active Shooter		Campus Evacuation		Civil Disturbance		Person Crimes		Property Crimes!	
10 (Will occur)	2	10	14	70	9	45	7	35	86	430	92	460
7 - 9 (Likely to occur)	18	72	55	220	33	132	42	168	56	224	53	212
4 - 6 (Might occur)	47	141	61	183	59	177	66	198	45	135	40	120
1 - 3 (Unlikely to occur)	138	276	83	166	108	216	93	186	26	52	28	56
0 (Will not occur)	9	9	1	1	5	5	5	5	0	0	0	0
HZ Value:		101.6		128.0		115.0		118.4		168.2		169.6

-- End of Attachment 2 --

Attachment 3: Human Impact (HI) Values

The following data tables show combined survey results as well as SME and community survey results for this measure.

Figure A3.1. Human Impact for Natural Hazards

Combined Survey Responses: Respondents assigned the highest combined HI to **Winter Storm**.

Scale	Earthquake		Flood		Severe Storm		Winter Storm!	
5 (50% or more)	60	360	41	246	117	702	162	972
4 (Less than 50%)	23	115	40	200	53	265	26	130
3 (Less than 25%)	38	152	56	224	40	160	29	116
2 (Less than 10%)	63	189	75	225	35	105	24	72
1 (Less than 1%)	61	122	37	74	11	22	17	34
0 (No impact)	15	15	9	9	2	2	1	1
HI Value:		158.8		163.0		209.3		220.8

SME Survey Responses: SMEs assigned the highest HI to **Winter Storm**.

Scale	Earthquake		Flood		Severe Storm		Winter Storm!	
5 (50% or more)	11	66	4	24	22	132	30	180
4 (Less than 50%)	6	30	5	25	6	30	4	20
3 (Less than 25%)	5	20	11	44	8	32	5	20
2 (Less than 10%)	13	39	19	57	7	21	2	6
1 (Less than 1%)	8	16	7	14	3	6	5	10
0 (No impact)	3	3	0	0	0	0	0	0
HI Value:		29.0		27.3		36.8		39.3

Community Survey Responses: Community members assigned the highest HI to **Winter Storm**.

Scale	Earthquake		Flood		Severe Storm		Winter Storm!	
5 (50% or more)	49	294	37	222	95	570	132	792
4 (Less than 50%)	17	85	35	175	47	235	22	110
3 (Less than 25%)	33	132	45	180	32	128	24	96
2 (Less than 10%)	50	150	56	168	28	84	22	66
1 (Less than 1%)	53	106	30	60	8	16	12	24
0 (No impact)	12	12	9	9	2	2	1	1
HI Value:		129.8		135.7		172.5		181.5

Figure A3.2. Human Impact for Accidental Hazards

Combined Survey Responses: Respondents assigned the highest combined HI to **Comms Outage**.

Scale	Aircraft Crash		Building Fire		HazMat Release		Disease Outbreak		Comms Outage!		Medical Emergency		Utility Outage		External Event	
5 (50% or more)	50	300	16	96	35	210	106	636	204	1224	18	108	121	726	36	216
4 (Less than 50%)	33	165	31	155	29	145	45	225	23	115	12	60	46	230	37	185
3 (Less than 25%)	39	156	58	232	37	148	47	188	18	72	28	112	42	168	52	208
2 (Less than 10%)	50	150	101	303	84	252	38	114	6	18	69	207	34	102	67	201
1 (Less than 1%)	68	136	51	102	68	136	21	42	8	16	124	248	11	22	55	110
0 (No impact)	19	19	2	2	4	4	1	1	1	1	4	4	2	2	7	7
HI Value:		154.3		148.3		149.2		201.0		241.0		123.2		208.3		154.5

SME Survey Responses: SMEs assigned the highest HI to **Comms Outage**.

Scale	Aircraft Crash		Building Fire		HazMat Release		Disease Outbreak		Comms Outage!		Medical Emergency		Utility Outage		External Event	
5 (50% or more)	12	72	0	0	2	12	13	78	37	222	0	0	18	108	4	24
4 (Less than 50%)	7	35	8	40	6	30	6	30	4	20	2	10	11	55	5	25
3 (Less than 25%)	7	28	11	44	4	16	10	40	3	12	2	8	11	44	11	44
2 (Less than 10%)	10	30	16	48	20	60	10	30	0	0	11	33	5	15	10	30
1 (Less than 1%)	9	18	11	22	14	28	7	14	2	4	30	60	1	2	14	28
0 (No impact)	1	1	0	0	0	0	0	0	0	0	1	1	0	0	2	2
HI Value:		30.7		25.7		24.3		32.0		43.0		18.7		37.3		25.5

Community Survey Responses: Community members assigned the highest HI to **Comms Outage**.

Scale	Aircraft Crash		Building Fire		HazMat Release		Disease Outbreak		Comms Outage!		Medical Emergency		Utility Outage		External Event	
5 (50% or more)	38	228	16	96	33	198	93	558	167	1002	18	108	103	618	32	192
4 (Less than 50%)	26	130	23	115	23	115	39	195	19	95	10	50	35	175	32	160
3 (Less than 25%)	32	128	47	188	33	132	37	148	15	60	26	104	31	124	41	164
2 (Less than 10%)	40	120	85	255	64	192	28	84	6	18	58	174	29	87	57	171
1 (Less than 1%)	59	118	40	80	54	108	14	28	6	12	94	188	10	20	41	82
0 (No impact)	18	18	2	2	4	4	1	1	1	1	3	3	2	2	5	5
HI Value:		123.7		122.7		124.8		169.0		198.0		104.5		171.0		129.0

Figure A3.3. Human Impact for Intentional Hazards

Combined Survey Responses: Respondents assigned the highest combined HI to **Campus Evacuation**.

Scale	Terrorist Threat		Active Shooter		Campus Evacuation!		Civil Disturbance		Person Crimes		Property Crimes	
5 (50% or more)	116	696	128	768	173	1038	85	510	18	108	10	60
4 (Less than 50%)	19	95	24	120	20	100	40	200	17	85	12	60
3 (Less than 25%)	25	100	24	96	25	100	59	236	36	144	35	140
2 (Less than 10%)	52	156	35	105	18	54	42	126	64	192	65	195
1 (Less than 1%)	42	84	48	96	20	40	25	50	121	242	134	268
0 (No impact)	5	5	1	1	3	3	6	6	0	0	1	1
HI Value:		189.3		197.7		222.5		188.0		128.5		120.7

SME Survey Responses: SMEs assigned the highest HI to **Campus Evacuation**.

Scale	Terrorist Threat		Active Shooter		Campus Evacuation!		Civil Disturbance		Person Crimes		Property Crimes	
5 (50% or more)	18	108	22	132	35	210	15	90	6	36	0	0
4 (Less than 50%)	4	20	1	5	1	5	12	60	1	5	1	5
3 (Less than 25%)	6	24	2	8	3	12	10	40	0	0	2	8
2 (Less than 10%)	12	36	6	18	3	9	5	15	10	30	10	30
1 (Less than 1%)	6	12	15	30	4	8	4	8	29	58	33	66
0 (No impact)	0	0	0	0	0	0	0	0	0	0	0	0
HI Value:		33.3		32.2		40.7		35.5		21.5		18.2

Community Survey Responses: Community members assigned the highest HI to **Campus Evacuation**.

Scale	Terrorist Threat		Active Shooter		Campus Evacuation!		Civil Disturbance		Person Crimes		Property Crimes	
5 (50% or more)	98	588	106	636	138	828	70	420	12	72	10	60
4 (Less than 50%)	15	75	23	115	19	95	28	140	16	80	11	55
3 (Less than 25%)	19	76	22	88	22	88	49	196	36	144	33	132
2 (Less than 10%)	40	120	29	87	15	45	37	111	54	162	55	165
1 (Less than 1%)	36	72	33	66	16	32	21	42	92	184	101	202
0 (No impact)	5	5	1	1	3	3	6	6	0	0	1	1
HI Value:		156.0		165.5		181.8		152.5		107.0		102.5

-- End of Attachment 3 --

Attachment 4: Economic Impact (EI) Values

The following data tables show combined survey results as well as SME and community survey results for this measure.

Figure A4.1. Economic Impact for Natural Hazards

Combined Survey Responses: Respondents assigned the highest combined EI to **Severe Storm**.

Scale	Earthquake		Flood		Severe Storm!		Winter Storm	
5 (50% or more)	24	144	27	162	51	306	39	234
4 (Less than 50%)	29	145	41	205	60	300	29	145
3 (Less than 25%)	48	192	67	268	64	256	65	260
2 (Less than 10%)	77	231	77	231	68	204	87	261
1 (Less than 1%)	60	120	36	72	13	26	37	74
0 (No impact)	20	20	10	10	3	3	3	3
EI Value:		142.0		158.0		182.5		162.8

SME Survey Responses: SMEs assigned the highest EI to **Severe Storm**.

Scale	Earthquake		Flood		Severe Storm!		Winter Storm	
5 (50% or more)	4	24	5	30	9	54	6	36
4 (Less than 50%)	8	40	5	25	7	35	4	20
3 (Less than 25%)	8	32	8	32	14	56	13	52
2 (Less than 10%)	14	42	21	63	12	36	15	45
1 (Less than 1%)	10	20	7	14	4	8	8	16
0 (No impact)	2	2	0	0	0	0	0	0
EI Value:		26.7		27.3		31.5		28.2

Community Survey Responses: Community members assigned the highest EI to **Severe Storm**.

Scale	Earthquake		Flood		Severe Storm!		Winter Storm	
5 (50% or more)	20	120	22	132	42	252	33	198
4 (Less than 50%)	21	105	36	180	53	265	25	125
3 (Less than 25%)	40	160	59	236	50	200	52	208
2 (Less than 10%)	63	189	56	168	56	168	72	216
1 (Less than 1%)	50	100	29	58	9	18	29	58
0 (No impact)	18	18	10	10	3	3	3	3
EI Value:		115.3		130.7		151.0		134.7

Figure A4.2. Economic Impact for Accidental Hazards

Combined Survey Responses: Respondents assigned the highest combined EI to **Disease Outbreak**.

Scale	Aircraft Crash		Building Fire		HazMat Release		Disease Outbreak!		Comms Outage		Medical Emergency		Utility Outage		External Event	
5 (50% or more)	45	270	24	144	21	126	72	432	76	456	10	60	42	252	13	78
4 (Less than 50%)	35	175	30	150	29	145	39	195	29	145	11	55	26	130	20	100
3 (Less than 25%)	49	196	70	280	51	204	54	216	57	228	25	100	52	208	35	140
2 (Less than 10%)	63	189	93	279	91	273	61	183	58	174	54	162	82	246	59	177
1 (Less than 1%)	49	98	40	80	59	118	31	62	39	78	122	244	49	98	110	220
0 (No impact)	19	19	3	3	6	6	2	2	1	1	34	34	4	4	19	19
EI Value:		157.8		156.0		145.3		181.7		180.3		109.2		156.3		122.3

SME Survey Responses: SMEs assigned the highest EI to **Aircraft Crash**.

Scale	Aircraft Crash!		Building Fire		HazMat Release		Disease Outbreak		Comms Outage		Medical Emergency		Utility Outage		External Event	
5 (50% or more)	9	54	0	0	1	6	10	60	12	72	0	0	2	12	1	6
4 (Less than 50%)	10	50	9	45	6	30	3	15	4	20	2	10	6	30	3	15
3 (Less than 25%)	9	36	15	60	9	36	10	40	10	40	1	4	12	48	4	16
2 (Less than 10%)	9	27	15	45	17	51	12	36	9	27	9	27	17	51	13	39
1 (Less than 1%)	8	16	7	14	13	26	10	20	11	22	25	50	9	18	23	46
0 (No impact)	1	1	0	0	0	0	1	1	0	0	9	9	0	0	2	2
EI Value:		30.7		27.3		24.8		28.7		30.2		16.7		26.5		20.7

Community Survey Responses: Community members assigned the highest EI to **Disease Outbreak**.

Scale	Aircraft Crash		Building Fire		HazMat Release		Disease Outbreak!		Comms Outage		Medical Emergency		Utility Outage		External Event	
5 (50% or more)	36	216	24	144	20	120	62	372	64	384	10	60	40	240	12	72
4 (Less than 50%)	25	125	21	105	23	115	36	180	25	125	9	45	20	100	17	85
3 (Less than 25%)	40	160	55	220	42	168	44	176	47	188	24	96	40	160	31	124
2 (Less than 10%)	54	162	78	234	74	222	49	147	49	147	45	135	65	195	46	138
1 (Less than 1%)	41	82	33	66	46	92	21	42	28	56	97	194	40	80	87	174
0 (No impact)	18	18	3	3	6	6	1	1	1	1	25	25	4	4	17	17
EI Value:		127.2		128.7		120.5		153.0		150.2		92.5		129.8		101.7

Figure A4.3. Economic Impact for Intentional Hazards

Combined Survey Responses: Respondents assigned the highest combined EI to **Active Shooter**.

Scale	Terrorist Threat		Active Shooter!		Campus Evacuation		Civil Disturbance		Person Crimes		Property Crimes	
5 (50% or more)	52	312	56	336	42	252	21	126	11	66	9	54
4 (Less than 50%)	35	175	34	170	30	150	30	150	13	65	15	75
3 (Less than 25%)	37	148	49	196	46	184	43	172	30	120	31	124
2 (Less than 10%)	73	219	60	180	69	207	75	225	56	168	66	198
1 (Less than 1%)	56	112	56	112	58	116	78	156	127	254	126	252
0 (No impact)	6	6	5	5	13	13	10	10	19	19	9	9
EI Value:		162.0		166.5		153.7		139.8		115.3		118.7

SME Survey Responses: SMEs assigned the highest EI to **Terrorist Threat**.

Scale	Terrorist Threat!		Active Shooter		Campus Evacuation		Civil Disturbance		Person Crimes		Property Crimes	
5 (50% or more)	8	48	7	42	6	36	0	0	1	6	0	0
4 (Less than 50%)	9	45	6	30	7	35	10	50	1	5	1	5
3 (Less than 25%)	9	36	11	44	10	40	6	24	4	16	3	12
2 (Less than 10%)	12	36	5	15	7	21	15	45	9	27	14	42
1 (Less than 1%)	8	16	17	34	13	26	15	30	28	56	25	50
0 (No impact)	0	0	0	0	3	3	0	0	3	3	3	3
EI Value:		30.2		27.5		26.8		24.8		18.8		18.7

Community Survey Responses: Community members assigned the highest EI to **Active Shooter**.

Scale	Terrorist Threat		Active Shooter!		Campus Evacuation		Civil Disturbance		Person Crimes		Property Crimes	
5 (50% or more)	44	264	49	294	36	216	21	126	10	60	9	54
4 (Less than 50%)	26	130	28	140	23	115	20	100	12	60	14	70
3 (Less than 25%)	28	112	38	152	36	144	37	148	26	104	28	112
2 (Less than 10%)	61	183	55	165	62	186	60	180	47	141	52	156
1 (Less than 1%)	48	96	39	78	45	90	63	126	99	198	101	202
0 (No impact)	6	6	5	5	10	10	10	10	16	16	6	6
EI Value:		131.8		139.0		126.8		115.0		96.5		100.0

-- End of Attachment 4 –

Attachment 5: Consequence (C) Scores

The following data tables show combined survey results as well as SME and community survey results for these scores.

Figure A5.1. Consequence Scores for Natural Hazards

Combined Survey Responses: Respondents assigned the highest combined C score to **Severe Storm**.

Natural Hazard Consequence (C) Scores	Earthquake	Flood	Severe Storm	Winter Storm
Human Impact (HI):	158.8	163.0	209.3	220.8
Economic Impact (EI):	142.0	158.0	182.5	162.8
(C) = HI + EI:	**300.8**	**321.0**	**391.8**	**383.7**

SME Survey Responses: SMEs assigned the highest C score to **Severe Storm**.

Natural Hazard Consequence (C) Scores	Earthquake	Flood	Severe Storm	Winter Storm
Human Impact (HI):	29.0	27.3	36.8	39.3
Economic Impact (EI):	26.7	27.3	31.5	28.2
(C) = HI + EI:	**55.7**	**54.7**	**68.3**	**67.5**

Community Survey Responses: Community members assigned the highest C score to **Severe Storm**.

Natural Hazard Consequence (C) Scores	Earthquake	Flood	Severe Storm	Winter Storm
Human Impact (HI):	129.8	135.7	172.5	181.5
Economic Impact (EI):	115.3	130.7	151.0	134.7
(C) = HI + EI:	**245.2**	**266.3**	**323.5**	**316.2**

Figure A5.2. Consequence Scores for Accidental Hazards

Combined Survey Responses: Respondents assigned the highest combined C score to **Comms Outage**.

Accidental Hazard Consequence (C) Scores	Aircraft Crash	Building Fire	HazMat Release	Disease Outbreak	Comms Outage	Medical Emergency	Utility Outage	External Event
Human Impact (HI):	154.3	148.3	149.2	201.0	241.0	123.2	208.3	154.5
Economic Impact (EI):	157.8	156.0	145.3	181.7	180.3	109.2	156.3	122.3
(C) = HI + EI:	**312.2**	**304.3**	**294.5**	**382.7**	**421.3**	**232.3**	**364.7**	**276.8**

SME Survey Responses: SMEs assigned the highest C score to **Comms Outage**.

Accidental Hazard Consequence (C) Scores	Aircraft Crash	Building Fire	HazMat Release	Disease Outbreak	Comms Outage	Medical Emergency	Utility Outage	External Event
Human Impact (HI):	30.7	25.7	24.3	32.0	43.0	18.7	37.3	25.5
Economic Impact (EI):	30.7	27.3	24.8	28.7	30.2	16.7	26.5	20.7
(C) = HI + EI:	**61.3**	**53.0**	**49.2**	**60.7**	**73.2**	**35.3**	**63.8**	**46.2**

Community Survey Responses: Community members assigned the highest C score to **Comms Outage**.

Accidental Hazard Consequence (C) Scores	Aircraft Crash	Building Fire	HazMat Release	Disease Outbreak	Comms Outage	Medical Emergency	Utility Outage	External Event
Human Impact (HI):	123.7	122.7	124.8	169.0	198.0	104.5	171.0	129.0
Economic Impact (EI):	127.2	128.7	120.5	153.0	150.2	92.5	129.8	101.7
(C) = HI + EI:	**250.8**	**251.3**	**245.3**	**322.0**	**348.2**	**197.0**	**300.8**	**230.7**

Figure A5.3. Consequence Scores for Intentional Hazards

Combined Survey Responses: Respondents assigned the highest combined C score to **Campus Evacuation**.

Intentional Hazard Consequence (C) Scores	Terrorist Threat	Active Shooter	Campus Evacuation	Civil Disturbance	Person Crimes	Property Crimes
Human Impact (HI):	189.3	197.7	222.5	188.0	128.5	120.7
Economic Impact (EI):	162.0	166.5	153.7	139.8	115.3	118.7
(C) = HI + EI:	**351.3**	**364.2**	**376.2**	**327.8**	**243.8**	**239.3**

SME Survey Responses: SMEs assigned the highest C score to **Campus Evacuation**.

Intentional Hazard Consequence (C) Scores	Terrorist Threat	Active Shooter	Campus Evacuation	Civil Disturbance	Person Crimes	Property Crimes
Human Impact (HI):	33.3	32.2	40.7	35.5	21.5	18.2
Economic Impact (EI):	30.2	27.5	26.8	24.8	18.8	18.7
(C) = HI + EI:	**63.5**	**59.7**	**67.5**	**60.3**	**40.3**	**36.8**

Community Survey Responses: Community members assigned the highest C score to **Campus Evacuation**.

Intentional Hazard Consequence (C) Scores	Terrorist Threat	Active Shooter	Campus Evacuation	Civil Disturbance	Person Crimes	Property Crimes
Human Impact (HI):	156.0	165.5	181.8	152.5	107.0	102.5
Economic Impact (EI):	131.8	139.0	126.8	115.0	96.5	100.0
(C) = HI + EI:	**287.8**	**304.5**	**308.7**	**267.5**	**203.5**	**202.5**

-- End of Attachment 5 --

Attachment 6: Probability (P) and Risk (R) Scores

The following data tables show combined survey results as well as SME and community survey results for these scores.

Figure A6.1. Risk Values for Natural Hazards

Combined Survey Responses: Respondents gave the highest combined R value to **Severe Storm**.

Primary Natural Hazard:	Earthquake	Flood	Severe Storm!	Winter Storm
Number of Responses (N):	257	252	255	258
Risk (R) = (P + C) / N:	**4.49**	**5.08**	**7.20**	**7.12**
Vulnerability Rating (V):	7	7	7	7
Hazard Value (HZ):	121.8	137.2	206.4	207.6
Probability (P) = V x HZ:	**852.6**	**960.4**	**1444.8**	**1453.2**
Human Impact (HI):	158.8	163.0	209.3	220.8
Economic Impact (EI):	142.0	158.0	182.5	162.8
Consequence (C) = HI + E:	**300.8**	**321.0**	**391.8**	**383.7**

SME Survey Responses: SMEs gave the highest R value to **Winter Storm**.

Primary Natural Hazard:	Earthquake	Flood	Severe Storm	Winter Storm!
Number of Responses (N):	46	46	46	46
Risk (R) = (P + C) / N:	**4.56**	**5.02**	**7.12**	**7.22**
Vulnerability Rating (V):	7	7	7	7
Hazard Value (HZ):	22.0	25.2	37.0	37.8
Probability (P) = V x HZ:	**154**	**176.4**	**259**	**264.6**
Human Impact (HI):	29.0	27.3	36.8	39.3
Economic Impact (EI):	26.7	27.3	31.5	28.2
Consequence (C) = HI + E:	**55.7**	**54.7**	**68.3**	**67.5**

Community Survey Responses: Community members gave the highest R value to **Severe Storm**.

Primary Natural Hazard:	Earthquake	Flood	Severe Storm!	Winter Storm
Number of Responses (N):	211	206	209	212
Risk (R) = (P + C) / N:	**4.47**	**5.10**	**7.22**	**7.10**
Vulnerability Rating (V):	7	7	7	7
Hazard Value (HZ):	99.8	112.0	169.4	169.8
Probability (P) = V x HZ:	**698.6**	**784**	**1185.8**	**1188.6**
Human Impact (HI):	129.8	135.7	172.5	181.5
Economic Impact (EI):	115.3	130.7	151.0	134.7
Consequence (C) = HI + E:	**245.2**	**266.3**	**323.5**	**316.2**

Figure A6.2. Risk Values for Accidental Hazards

Combined Survey Responses: Respondents gave the highest combined R value to **Utility Outage**.

Primary Accidental Hazard:	Aircraft Crash	Building Fire	HazMat Release	Disease Outbreak	Comms Outage	Medical Emergency	Utility Outage!	External Event
Number of Responses (N):	258	256	250	254	259	246	246	246
Risk (R) = (P + C) / N:	**4.17**	**5.67**	**5.17**	**6.16**	**7.23**	**6.45**	**7.69**	**5.97**
Vulnerability Rating (V):	7	7	7	7	7	7	7	7
Hazard Value (HZ):	109.0	164.0	142.6	169.0	207.2	193.4	218.2	170.4
Probability (P) = V x HZ:	**763**	**1148**	**998.2**	**1183**	**1450.4**	**1353.8**	**1527.4**	**1192.8**
Human Impact (HI):	154.3	148.3	149.2	201.0	241.0	123.2	208.3	154.5
Economic Impact (EI):	157.8	156.0	145.3	181.7	180.3	109.2	156.3	122.3
Consequence (C) = HI + E:	**312.2**	**304.3**	**294.5**	**382.7**	**421.3**	**232.3**	**364.7**	**276.8**

SME Survey Responses: SMEs gave the highest R value to **Utility Outage**.

Primary Accidental Hazard:	Aircraft Crash	Building Fire	HazMat Release	Disease Outbreak	Comms Outage	Medical Emergency	Utility Outage!	External Event
Number of Responses (N):	46	46	46	46	46	46	46	46
Risk (R) = (P + C) / N:	**4.38**	**5.87**	**5.48**	**5.61**	**7.16**	**6.58**	**7.44**	**5.81**
Vulnerability Rating (V):	7	7	7	7	7	7	7	7
Hazard Value (HZ):	20.0	31.0	29.0	28.2	36.6	38.2	39.8	31.6
Probability (P) = V x HZ:	**140**	**217**	**203**	**197.4**	**256.2**	**267.4**	**278.6**	**221.2**
Human Impact (HI):	30.7	25.7	24.3	32.0	43.0	18.7	37.3	25.5
Economic Impact (EI):	30.7	27.3	24.8	28.7	30.2	16.7	26.5	20.7
Consequence (C) = HI + E:	**61.3**	**53.0**	**49.2**	**60.7**	**73.2**	**35.3**	**63.8**	**46.2**

Community Survey Responses: Community members gave the highest R value to **Utility Outage**.

Primary Accidental Hazard:	Aircraft Crash	Building Fire	HazMat Release	Disease Outbreak	Comms Outage	Medical Emergency	Utility Outage!	External Event
Number of Responses (N):	212	210	204	208	213	200	200	200
Risk (R) = (P + C) / N:	**4.12**	**5.63**	**5.10**	**6.29**	**7.24**	**6.42**	**7.75**	**6.01**
Vulnerability Rating (V):	7	7	7	7	7	7	7	7
Hazard Value (HZ):	89.0	133.0	113.6	140.8	170.6	155.2	178.4	138.8
Probability (P) = V x HZ:	**623**	**931**	**795.2**	**985.6**	**1194.2**	**1086.4**	**1248.8**	**971.6**
Human Impact (HI):	123.7	122.7	124.8	169.0	198.0	104.5	171.0	129.0
Economic Impact (EI):	127.2	128.7	120.5	153.0	150.2	92.5	129.8	101.7
Consequence (C) = HI + E:	**250.8**	**251.3**	**245.3**	**322.0**	**348.2**	**197.0**	**300.8**	**230.7**

Figure A6.3. Risk Values for Intentional Hazards

Combined Survey Responses: Respondents gave the highest combined R value to **Crime Against Property**.

Primary Intentional Hazard:	Terrorist Threat	Active Shooter	Campus Evacuation	Civil Disturbance	Person Crimes	Property Crimes!
Number of Responses (N):	256	258	255	251	249	250
Risk (R) = (P + C) / N:	**5.26**	**6.22**	**5.84**	**5.94**	**7.58**	**7.63**
Vulnerability Rating (V):	8	8	8	8	8	8
Hazard Value (HZ):	124.4	155.0	139.0	145.4	205.6	208.6
Probability (P) = V x HZ:	**995.2**	**1240**	**1112**	**1163.2**	**1644.8**	**1668.8**
Human Impact (HI):	189.3	197.7	222.5	188.0	128.5	120.7
Economic Impact (EI):	162.0	166.5	153.7	139.8	115.3	118.7
Consequence (C) = HI + E:	**351.3**	**364.2**	**376.2**	**327.8**	**243.8**	**239.3**

SME Survey Responses: SMEs gave the highest R value to **Crime Against Property**.

Primary Intentional Hazard:	Terrorist Threat	Active Shooter	Campus Evacuation	Civil Disturbance	Person Crimes	Property Crimes!
Number of Responses (N):	46	46	46	46	46	46
Risk (R) = (P + C) / N:	**5.35**	**5.99**	**5.64**	**6.01**	**7.38**	**7.58**
Vulnerability Rating (V):	8	8	8	8	8	8
Hazard Value (HZ):	22.8	27.0	24.0	27.0	37.4	39.0
Probability (P) = V x HZ:	**182.4**	**216**	**192**	**216**	**299.2**	**312**
Human Impact (HI):	33.3	32.2	40.7	35.5	21.5	18.2
Economic Impact (EI):	30.2	27.5	26.8	24.8	18.8	18.7
Consequence (C) = HI + E:	**63.5**	**59.7**	**67.5**	**60.3**	**40.3**	**36.8**

Community Survey Responses: Community members gave the highest R value to **Crime Against Property**.

Primary Intentional Hazard:	Terrorist Threat	Active Shooter	Campus Evacuation	Civil Disturbance	Person Crimes	Property Crimes!
Number of Responses (N):	210	212	209	205	203	204
Risk (R) = (P + C) / N:	**5.24**	**6.27**	**5.88**	**5.93**	**7.63**	**7.64**
Vulnerability Rating (V):	8	8	8	8	8	8
Hazard Value (HZ):	101.6	128.0	115.0	118.4	168.2	169.6
Probability (P) = V x HZ:	**812.8**	**1024**	**920**	**947.2**	**1345.6**	**1356.8**
Human Impact (HI):	156.0	165.5	181.8	152.5	107.0	102.5
Economic Impact (EI):	131.8	139.0	126.8	115.0	96.5	100.0
Consequence (C) = HI + E:	**287.8**	**304.5**	**308.7**	**267.5**	**203.5**	**202.5**

-- End of Attachment 6 --

Attachment 7: All-Hazard Rankings

The following tables rank all hazard types by risk, impacts, and probability.

Figure A7.1. Risk Rankings for All Hazards

Rankings for all hazards by R score. Higher ranked hazards have the greatest overall probability of occurrence and the greatest overall impacts on the UMBC campus and community.

Rank	R Score	Hazard Type
1	7.75	**PRIMARY OVERALL AND PRIMARY ACCIDENTAL HAZARD** **Utility or Infrastructure Outage. This includes water, power, heating or cooling systems, elevators, or fire alarm and sprinkler system outages.**
2	7.64	**PRIMARY INTENTIONAL HAZARD** **Crime Against Property Any form of theft or intentional damage caused to property owned by an individual or owned by the University.**
3	7.63	Crime Against Persons. Any form of assault on an individual or group.
4	7.24	IT or Communications Outage.
5	7.22	**PRIMARY NATURAL HAZARD** **Severe Storm. This includes tornadoes, high winds, severe thunderstorms, hurricanes, and tropical storms.**
6	7.10	Winter Storm.
7	6.42	Medical Emergency.
8	6.29	Infectious Disease Outbreak. Infectious diseases other than COVID-19.
9	6.27	Active Shooter/Workplace Violence.
10	6.01	Other External Events. These are events initiated by an agency or organization outside of UMBC. Examples that have occurred in the past are: activation of a FEMA shelter on campus; a search for a patient missing from a local hospital; or diversion of traffic through campus due to an accident on nearby highways.
11	5.93	Civil Disturbance. This includes a riot or violent protest.
12	5.88	Campus-wide evacuation resulting from a bomb or explosive threat.
13	5.63	Fire Emergency occurring inside a building or outside on the grounds of the campus.
14	5.24	Terrorist Threat.
15	5.10	Accidental Release of Hazardous Materials.
16	5.10	Flood.
17	4.47	Earthquake.
18	4.12	Aircraft Crash.

Figure A7.2. Impact Rankings for All Hazards

Rankings for all hazards by C score. Higher ranked hazards may have the greatest combined human and economic impact on the UMBC campus and community if an actual incident occurred.		
Rank	**C Score**	**Hazard Type**
1	**348.17**	IT or Communications Outage.
2	**323.50**	**PRIMARY NATURAL HAZARD** **Severe Storm. This includes tornadoes, high winds, severe thunderstorms, hurricanes, and tropical storms.**
3	**322.00**	Infectious Disease Outbreak. Infectious diseases other than COVID-19.
4	**316.17**	Winter Storm
5	**308.67**	Campus-wide evacuation resulting from a bomb or explosive threat.
6	**304.50**	Active Shooter/Workplace Violence.
7	**300.83**	**PRIMARY OVERALL AND PRIMARY ACCIDENTAL HAZARD** **Utility or Infrastructure Outage. This includes water, power, heating or cooling systems, elevators, or fire alarm and sprinkler system outages.**
8	**287.83**	Terrorist Threat
9	**267.50**	Civil Disturbance. This includes a riot or violent protest.
10	**266.33**	Flood
11	**251.33**	Fire Emergency occurring inside a building or outside on the grounds of the campus.
12	**250.83**	Aircraft Crash
13	**245.33**	Accidental Release of Hazardous Materials.
14	**245.17**	Earthquake
15	**230.67**	Other External Events. These are events initiated by an agency or organization outside of UMBC. Examples that have occurred in the past are: activation of a FEMA shelter on campus; a search for a patient missing from a local hospital; or diversion of traffic through campus due to an accident on nearby highways.
16	**203.50**	Crime Against Persons. Any form of assault on an individual or group.
17	**202.50**	**PRIMARY INTENTIONAL HAZARD** **Crime Against Property Any form of theft or intentional damage caused to property owned by an individual or owned by the University.**
18	**197.00**	Medical Emergency

Figure A7.1. Probability Rankings for All Hazards

Rankings for all hazards by P score. Higher ranked hazards have the greatest probability of occurrence based on vulnerability ratings and combined survey results.		
Rank	**P Score**	**Hazard Type**
1	**1356.80**	**PRIMARY INTENTIONAL HAZARD** **Crime Against Property. Any form of theft or intentional damage caused to property owned by an individual or owned by the University.**
2	**1345.60**	Crime Against Persons. Any form of assault on an individual or group.
3	**1248.80**	**PRIMARY OVERALL AND PRIMARY ACCIDENTAL HAZARD** **Utility or Infrastructure Outage. This includes water, power, heating or cooling systems, elevators, or fire alarm and sprinkler system outages.**
4	**1194.20**	IT or Communications Outage.
5	**1188.60**	Winter Storm
6	**1185.80**	**PRIMARY NATURAL HAZARD** **Severe Storm. This includes tornadoes, high winds, severe thunderstorms, hurricanes, and tropical storms.**
7	**1086.40**	Medical Emergency
8	**1024.00**	Active Shooter/Workplace Violence.
9	**985.60**	Infectious Disease Outbreak. Infectious diseases other than COVID-19.
10	**971.60**	Other External Events. These are events initiated by an agency or organization outside of UMBC. Examples that have occurred in the past are: activation of a FEMA shelter on campus; a search for a patient missing from a local hospital; or diversion of traffic through campus due to an accident on nearby highways.
11	**947.20**	Civil Disturbance. This includes a riot or violent protest.
12	**931.00**	Fire Emergency occurring inside a building or outside on the grounds of the campus.
13	**920.00**	Campus-wide evacuation resulting from a bomb or explosive threat.
14	**812.80**	Terrorist Threat
15	**795.20**	Accidental Release of Hazardous Materials.
16	**784.00**	Flood
17	**698.60**	Earthquake
18	**623.00**	Aircraft Crash

-- End of Document - Nothing Follows --