5.3 HAZARD RANKING

After the hazards of concern were identified for Morris County, the hazards were ranked to describe their probability of occurrence and their impact on population, property (general building stock including critical facilities) and the economy. Each participating city, town, township, or borough may have differing degrees of risk exposure and vulnerability compared to the County as a whole; therefore each jurisdiction ranked the degree of risk to each hazard as it pertains to their community using the same methodology as applied to the County-wide ranking. This assured consistency in the overall ranking of risk process. The hazard ranking for the County and each participating district can be found in their jurisdictional annex in Volume II of this plan.

2015 Plan Update Changes

- The 2010 HMP hazard ranking was presented in Section 7. For the 2015 HMP update, the hazard ranking is presented in subsection 5.3 (Risk Assessment – Hazard Ranking).
- The 2010 HMP hazard ranking only considered flood, high wind, earthquake/geological, dam failure, and winter storm. Each hazard was ranked using various methods. The 2015 HMP update hazard ranking methodology was expanded to include probability of occurrence and impact to population and economy. The 2015 HMP update ranking also includes all hazards of concern for the County.

5.3.1 Hazard Ranking Methodology

The methodology used to rank the hazards of concern for Morris County is described below. Estimates of risk for the County were developed using methodologies promoted by FEMA's hazard mitigation planning guidance and generated by FEMA's HAZUS-MH risk assessment tool.

Probability of Occurrence

The probability of occurrence is an estimate of how often a hazard event occurs. A review of historic events assists with this determination. Each hazard of concern is rated in accordance with the numerical ratings and definitions in Table 5.3-1.

Table 5.3-1. Probability of Occurrence Ranking Factors

Rating	Probability Category	Definition
1	Rare	Hazard event is not likely to occur within 100 years (>1% chance of occurrence in any given year)
2	Occasional	Hazard event is likely to occur within 100 years (1% chance of occurrence in any given year)
3	Frequent	Hazard event is likely to occur within 25 years (4% chance of occurrence in any given year)

Impact

The impact of each hazard is considered in three categories: impact on population, impact on property (general building stock including critical facilities), and impact on the economy. Based on documented historic losses and a subjective assessment by the Planning Committee, an impact rating of high, medium, or low is assigned with a corresponding numeric value for each hazard of concern. In addition, a weighting factor is assigned to each impact category: three (3) for population, two (2) for property, and one (1) for economy. This gives the

impact on population the greatest weight in evaluating the impact of a hazard. Table 5.3-2 presents the numerical rating, weighted factor and description for each impact category

Table 5.3-2. Numerical Values and Definitions for Impacts on Population, Property and Economy

Category	Weighting Factor	Low Impact* (1)	Medium Impact (2)	High Impact (3)
Population	3	14% or less of your population is exposed to a hazard with potential for measurable life safety impact, due to its extent and location	15% to 29% of your population is exposed to a hazard with potential for measurable life safety impact, due to its extent and location	30% or more of your population is exposed to a hazard with potential for measurable life safety impact, due to its extent and location
Property	2	Property exposure is 14% or less of the total replacement cost for your community	Property exposure is 15% to 29% of the total replacement cost for your community	Property exposure is 30% or more of the total replacement cost for your community
Economy	1	Loss estimate is 9% or less of the total replacement cost for your community	Loss estimate is 10% to 19% of the total replacement cost for your community	Loss estimate is 20% or more of the total replacement cost for your community

Note: A numerical value of zero is assigned if there is no impact.

**For the purposes of this exercise, "impacted" means exposed for population and property and loss for economy.*

Risk Ranking Value

The risk ranking for each hazard is then calculated by multiplying the numerical value for probability of occurrence by the sum of the numerical values for impact. The equation is as follows: Weighting Factor (1, 2, or 3) X Impact Value (6 to 18) = Hazard Ranking Value. Based on the total for each hazard, a priority ranking is assigned to each hazard of concern (high, medium, or low).

5.3.2 Hazard Ranking Results

Using the process described above, the risk ranking for the identified hazards of concern was determined for Morris County. Based on the combined risk values for probability of occurrence and impact to Morris County, a priority ranking of "high", "medium" or "low" risk was assigned. The hazard ranking for the Morris County planning area is detailed in the subsequent tables that present the step-wise process for the ranking. The county–wide risk ranking includes the entire planning area and may not reflect the highest risk indicated for any of the participating jurisdictions. The resulting ranks of each municipality indicate the differing degrees of risk exposure, and vulnerability. The results support the appropriate selection and prioritization of initiatives to reduce the highest levels of risk for each municipality. Both the County and the participating jurisdictions have applied the same methodology to develop the county-wide risk and local rankings to ensure consistency in the overall ranking of risk.

This risk ranking exercise serves two purposes: 1) to describe the probability of occurrence for each hazard, and 2) to describe the impact each would have on the people, property and economy of Morris County. Estimates of risk for the County were developed using methodologies promoted by FEMA's hazard mitigation planning guidance and generated by FEMA's HAZUS-MH risk assessment tool.

Table 5.3-3 shows the probability ranking assigned for likelihood of occurrence for each hazard.

Table 5.3-3. Probability of Occurrence Ranking for Hazards of Concern for Morris County

Hazard of Concern	Probability	Numeric Value
Dam Failure	Occasional	2
Drought	Frequent	3
Earthquake	Occasional	2
Extreme Temperature	Frequent	3
Flood	Frequent	3
Geological Hazards	Frequent	3
Severe Weather	Frequent	3
Severe Winter Weather	Frequent	3
Wildfire	Frequent	3
Disease Outbreak	Frequent	3
Hazardous Materials	Frequent	3
Infestation	Frequent	3

Table 5.3-4 shows the impact evaluation results for each hazard of concern, including impact on property, structures, and the economy on the County level. It is noted that several hazards that have a high impact on the local jurisdictional level, may have a lower impact when analyzed county-wide. Jurisdictional ranking results are presented in each local annex in Section 9 of this plan. The weighting factor results and a total impact for each hazard also are summarized.

Table 5.3-4. Impact Ranking for Hazards of Concern for Morris County

Hazard of Concern	Population			Property			Economy			Total Impact Rating (Population + Property + Economy)
	Impact	Numeric Value	Multiplied by Weighing Factor (3)	Impact	Numeric Value	Multiplied by Weighing Factor (2)	Impact	Numeric Value	Multiplied by Weighing Factor (1)	
Dam Failure	Medium	2	2 x 3 = 6	Medium	2	2 x 2 = 4	Medium	2	2 x 1 = 2	12
Drought	Medium	2	2 x 3 = 6	Low	1	1 x 2 = 2	Low	1	1 x 1 = 1	9
Earthquake	High	3	3 x 3 = 9	High	3	3 x 2 = 6	Low	1	1 x 1 = 1	16
Extreme Temperature	Low	1	1 x 3 = 3	Low	1	1 x 2 = 2	Low	1	1 x 1 = 1	6
Flood	Low	1	1 x 3 = 3	Low	1	1 x 2 = 2	Low	1	1 x 1 = 1	6
Geological Hazards	Low	1	1 x 3 = 3	Low	1	1 x 2 = 2	Low	1	1 x 1 = 1	6
Severe Weather	High	3	3 x 3 = 9	High	3	3 x 2 = 6	Low	1	1 x 1 = 1	16
Severe Winter Weather	High	3	3 x 3 = 9	High	3	3 x 2 = 6	High	3	3 x 1 = 3	18
Wildfire	Low	1	1 x 3 = 3	Low	1	1 x 2 = 2	Low	1	1 x 1 = 1	6
Disease Outbreak	High	3	3 x 3 = 9	Low	1	1 x 2 = 2	Low	1	1 x 1 = 1	12
Hazardous Materials	High	3	3 x 3 = 9	Low	1	1 x 2 = 2	Low	1	1 x 1 = 1	12
Infestation	Low	1	1 x 3 = 3	Low	1	1 x 2 = 2	Low	1	1 x 1 = 1	6

Table 5.3-5 presents the total ranking value for each hazard.

Table 5.3-5. Total Risk Ranking Value for Hazards of Concern for Morris County

Hazard of Concern	Probability	Impact	Total = (Probability x Impact)
Dam Failure	2	12	24
Drought	3	9	27
Earthquake	2	16	32
Extreme Temperature	3	6	18
Flood	3	6	18
Geological Hazards	3	6	18
Severe Weather	3	16	48
Severe Winter Weather	3	18	54
Wildfire	3	6	18
Disease Outbreak	3	12	36
Hazardous Materials	3	12	36
Infestation	3	6	18

Refer to Section 9 for the hazard ranking category by jurisdiction assigned for each hazard of concern. The ranking categories are determined by an evaluation of the total risk ranking score into three categories (low, medium and high) whereby a score of 14 and below is categorized as low, 15 to 30 is medium, and 31 and over is considered a high risk category.

These rankings have been used as one of the bases for identifying the jurisdictional hazard mitigation strategies included in Section 9 of this plan. The summary rankings for the County reflect the results of the vulnerability analysis for each hazard of concern and vary from the specific results of each jurisdiction. For example the severe storm hazard may be ranked high in one jurisdiction, but due to the exposure and impact county-wide, it is ranked as a medium hazard and is addressed in the county mitigation strategy accordingly

The hazard rankings indicated in this plan update have been adjusted from the 2010 plan due to the improved vulnerability assessment based on structure-specific data available from the County rather than HAZUS default aggregate data as discussed in Section 5.1, Methodology. Any changes to the ranking results therefore do not necessarily reflect significant changes in exposure, but a more refined vulnerability analysis methodology. The summary County level values reflect the vulnerability data on the county level and do not represent an average of jurisdiction ranks or the highest rank indicated in Morris County. These designations are an element of the prioritization criteria as detailed in Section 6 of this plan.

5.4 HAZARDS PROFILES AND VULNERABILITY ASSESSMENT

The following sections profile and assess vulnerability for each hazard of concern. For each hazard, the profile includes: the hazard description; its location and extent; previous occurrences and losses; and the probability of future events. The vulnerability assessment for each hazard includes: an overview of vulnerability; the data and methodology used; the impact on life, health and safety; impact on general building stock; impact on critical facilities; impact on the economy; additional data needs and next steps; and the overall vulnerability assessment finding. Hazards are presented as listed above, starting with the severe storm hazard and ending with the earthquake hazard.