Door County Hazard Mitigation Plan

2022-2026

Door County Emergency Management Department

https://www.co.door.wi.gov/161/Emergency-Management

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This plan serves to update the original Door County Multi-Hazard Mitigation Plan (2016-2021) that was developed by the Door County Land Use Services Department (formerly Planning Department). Door County is updating the plan through the Pre-Disaster Mitigation Program with grant funding made available through Wisconsin Emergency Management and the Federal Emergency Management Agency. This plan was created through a collaborative effort between the Door County Emergency Management and Land Use Services Departments.

Adopted by the Door County Board of Supervisors on _____, 2022

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Introduction

In 2000, the U.S. Congress passed the Disaster Mitigation Act, intended to reduce public and private expenses associated with disasters and to speed up response time to and reduce recovery time from disasters. The purpose of this act, and this Door County Hazard Mitigation Plan, is "to reduce the loss of life and property, human suffering, economic disruption, and disaster assistance costs resulting from natural disasters."

The Disaster Mitigation Act included a requirement for local governments to prepare hazard mitigation plans in order to be eligible for funding from the Federal Emergency Management Administration (FEMA) for mitigation activities, both pre- and post-natural disaster, through the Pre-Disaster Mitigation Assistance Program and the Hazard Mitigation Grant Program. Addressing humanmade/technological hazards is encouraged, but not required. Without a FEMA-approved and adopted plan, governments cannot utilize funding through the Pre-Disaster Mitigation Grant Program. In order for a local government without a FEMA-approved and adopted plan to be eligible to receive funding through the Hazard Mitigation Grant Program, they would have to agree to prepare a hazard mitigation plan within one year after a disaster occurs. FEMA may accept multi-jurisdictional plans that meet the requirements of Federal Register 44 CFR §201.6.

In 2014, the Door County Land Use Services (then "Planning") and Emergency Services Departments partnered to develop the Door County Hazard Mitigation Plan in compliance with FEMA requirements for a multi-jurisdictional plan. The county's five incorporated municipalities (City of Sturgeon Bay and Villages of Egg Harbor, Ephraim, Forestville, and Sister Bay) agreed to participate in the development of this plan, as well as other county departments and outside agencies with an interest in disaster management. This plan was certified by FEMA in 2016.

Per FEMA, Door County must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within 5 years to continue to be eligible for FEMA mitigation project grant funding. This Plan is an update of the 2016 plan and represents the next five-year planning period between 2022 and 2026. The planning area is county-wide, however, the Village of Forestville did not participate in this Plan update. The participating jurisdictions are Door County and the Villages of Egg Harbor, Ephraim, and Sister Bay.

Since the 2016 plan, the county's Emergency Management Department has gone through significant organizational change. Prior to the current Emergency Management Director starting his position in May of 2018, the previous director worked full-time at emergency management. The current Director was hired to work one-half time communications and one-half time emergency management. At the time the current Director started his position, parts of the county were dealing with historically high water levels on Lake Michigan and resultant flooding. The Director organized an educational seminar regarding the flooding that was held in January of 2020. (Note: presentation slides from this seminar can be found at https://www.co.door.wi.gov/444/Flooding.) Following the worst of the flooding, the COVID-19 pandemic began and the large majority of the Director's time went from dealing with flooding issues to dealing with COVID-19 response. The flooding has subsided, however, the Director expects more work regarding communicable diseases will continue for years to come. There are many lessons learned from and still to be learned from the pandemic.

Originally, this Plan was to be largely based on the state's 2021 update of its hazard mitigation plan, which was to include both natural and non-natural hazard mitigation strategies. Wisconsin Emergency Management is no longer posting update information on their Website, though, and, by all appearances, the state's plan update is being delayed, likely due to the pandemic. As such, this Plan focuses only on the most relevant natural hazards, with that information being updated based on the state's 2016 hazard mitigation plan and other available sources.

While the county's 2016 plan included information on non-natural hazards, this Plan does not. The county foresees the next update of this Plan including non-natural hazards, based on if/how the state addresses non-natural hazards in its next plan update. The non-natural hazard information from the county's 2016 is still being included in this Plan as an appendix in order to maintain continuity between plans.

Plan Organization

This Plan is organized based on the elements provided in the "Local Mitigation Planning Handbook" published by FEMA. The handbook covers Title 44 Code of Federal Regulations §201.6 for FEMA approval and eligibility to apply for FEMA hazard mitigation assistance programs. There are also appendices that support the information provided in the elements. Each section of this Plan is briefly described below.

- Element A: Planning Process Summary. This section discusses how this Plan was developed and future activities for allowing public comment on the Plan and keeping it updated.

- Element B: Risk Assessment Summary. This section discusses how the risk assessment was conducted including ranking criteria. A chart is provided that outlines hazard location, extent/magnitude, previous occurrences, and probability for future occurrence. The chart also outlines potential impacts and a summary of vulnerability.

- Element C: Mitigation Strategies. This section provides the mitigation strategies for Door County, the City of Sturgeon Bay, and the Villages of Egg Harbor, Ephraim, and Sister Bay.

- Element D: Plan Review, Evaluation, and Implementation. This section discusses how the plan was revised to reflect changes in development, progress in local mitigation efforts, and changes in priority.

- Element E: Plan Adoption. This section points to documentation that the plan has been formally adopted by the governing body of the County, City, and three Villages.

- Appendix A: Planning Process Documents. This section provides supporting documentation for the planning process including signed Memorandum of Agreements and meeting notes.

- Appendix B: Risk Assessment Documents - Hazard Types, Community Assets, and Community Capabilities. This section provides more detailed descriptions of hazard types, location of hazards, extent, and previous occurrences. It provides information on community capabilities and assets broken down by Northern Door, Central Door, and Southern Door.

- Appendix C: Non-Natural Hazard Types, Descriptions, and Mitigation Strategies From 2016 Plan. This section provides the non-natural hazard information from the county's 2016 plan. This information has not been updated for this Plan and is provided for reference only for potentially including in the next plan update.

- Appendix D: Municipal Floodplain Maps. This section provides maps of the City and three Villages showing the 100-year floodplain and buildings and roads that are located within those areas.

ELEMENT A: PLANNING PROCESS SUMMARY

In September of 2020, FEMA approved a grant application from Door County in the amount of $33,000 for the update of the county's 2016 hazard mitigation plan. FEMA provided 75% ($24,750), Wisconsin Emergency Management provided 12.5% ($4,125), and Door County provided the remaining 12.5% ($4,125). The draft plan was due to FEMA by December 30, 2021, with the final plan to be completed and approved by FEMA on or before October 31st, 2022.

Listed below are the planning process elements and a timeline that describes the steps taken to develop this Plan in accordance with FEMA regulations.

Elements A1 – A3 from the handbook regarding planning processes are listed below. A timeline that outlines the steps taken to develop this Plan in accordance with FEMA regulations is provided after Element A3. Elements A1 – A3, the timeline, and items provided in Appendix A outline and document Door County's planning process.

After the timeline, Elements A4 – A6 are addressed. These elements discuss the following topics:

- review and incorporation of existing plans, studies, reports, and technical information
- plan maintenance process and how the county will continue public participation in the plan maintenance process
- method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle

Element A1. Per 44 CFR 5201.6(c)(1), the plan shall document the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

Element A2. Per 44 CFR 5201.6(b)(2), the planning process shall include an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and non-profit interests to be involved in the planning process.

Element A3. Per 44 CFR §201.6(b)(1), the planning process shall include an opportunity for the public to comment on the plan during the drafting stage and prior to plan approval.

Meetings/Activity Timeline:

- Grant Application Approved (September 18th, 2020). A letter from FEMA to Wisconsin Emergency Management was sent, approving the application for a Local Multi-Jurisdictional Hazard Mitigation Plan.
- Pre-panning meeting with Door County Emergency Management (EM) and Land Use Services (LUS) Departments (October 23, 2020). Discussed grant acceptance paperwork and method of updating plan.
- Public Safety Committee Meeting (December 13th, 2020). The Public Safety Committee voted to approve acceptance of the grant by the Door County Board of Supervisors.
- Door County Board of Supervisors Approval of Grant Acceptance Resolution (December 14th, 2020).
- Pre-panning meeting with LUS and EM. (December 22nd, 2020). Discussed Wisconsin Emergency Management's review notes of 2016 plan, and discussed process for updating plan.
- Outreach to municipalities (February 3rd, 2021). LUS contacted all municipalities via phone regarding their participation.

- Emergency Management committee meeting (Feb. 8th, 2021). The EM committee reviewed a memo regarding the planning process for the update. See memo in Appendix A.
- Memorandum of Agreement (April 26th, 2021) The City and four villages were emailed a Memorandum of Agreement for their participation. Note: The City and Villages of Ephraim, Egg Harbor, and Sister Bay returned their signed agreements. Nothing was received from the Village of Forestville. See Appendix A for the signed Memoranda.
- 1st Multi-Jurisdictional Planning Team Meeting (June 10th, 2021. See Appendix A for the meeting notes.)
    - reviewed Wisconsin Emergency Management comments regarding 2016 hazard mitigation plan
    - reviewed community capabilities form, set due date for any changes
    - reviewed municipal maps, set due date for any changes
    - reviewed state's risk assessment and discussed approach for the county's risk assessment
- 2nd Multi-Jurisdictional Planning Team Meeting (August 13th, 2021, See Appendix A for the meeting notes.)
- Press release issued advertising opening house meetings to be held on September 29th, 2021. (September 16th, 2021). EM/LUS Departments issued/sent a press release and email regarding the open house meetings being hosted by the EM/LUS Departments to be held on September 29th to review the Plan. Agencies notified included local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development, and neighboring communities. The email described where to view the draft Plan on-line and how to offer input in writing by faxing, emailing, or mailing the LUS Department. Comments requested by October 10th, 2015.
- Open house meetings (September 29th, 2021. See Appendix A for meeting agenda and attendance.)

  Open house meetings were held virtually between 4:30 p.m. and 6:30 p.m. (~10 minute presentation at 4:30 p.m., 5:15 p.m., and 6 p.m.). Comments requested by October 10th, 2021.
- Public Safety Committee plan discussion/approval (October 12th, 2021). The Public Safety Committee voted to approve recommendation of the Plan by the Door County Board of Supervisor.
- Resource Planning Committee notification (October 21st, 2021).
- Municipality notification/approval (due by November 19th, 2021).
- Door County Board of Supervisors plan discussion/approval (December 14th, 2021). The Door County Board of Supervisors approved submittal of the Plan to Wisconsin Emergency Management on _____.
- Plan submittal to Wisconsin Emergency Management (December 2021). The Plan draft was submitted to Wisconsin Emergency Management for their review and comment.
- County and Municipal Adoption (early 2022, after Wisconsin Emergency Management notifies Door County Emergency Management that the Plan has been conditionally approved.). Door County Emergency Management submits the Plan to the Door County Board of Supervisors for their adoption. LUS emails incorporated municipalities the conditionally approved plan along with a request for official adoption by the municipality.
- Final certification date (June – October, 2022)

Element A4. Per 44 CFR §201.6(b)(3), the plan shall describe the review and incorporation of existing plans, studies, reports, and technical information.

The following plans, studies, reports, and technical information were reviewed and incorporated into this Plan.

- Door County Comprehensive and Farmland Preservation Plan 2035

  Web address: https://www.co.door.wi.gov/1026/Hazard-Mitigation-Plan

- Discovery Report, Great Lakes Coastal Flood Study, Lake Michigan, Basin-Wide Report, Report Number 01, February 2013; Appendix F, Kewaunee, Door, and Brown Counties, WI, Discovery Report

  Web address: http://www.greatlakescoast.org/great-lakes-coastal-analysis-and-mapping/outreach/discovery-reports/

- National Oceanic Atmospheric Administration (NOAA), Storm Events Database and additional drought information from the "Climate at a Glance"

  Web address: https://www.ncdc.noaa.gov/stormevents/

- State of Wisconsin Hazard Mitigation Plan, Wisconsin Emergency Management, Department of Military Affairs, October 2016

  Web address: https://dma.wi.gov/DMA/wem/mitigation/2016-hazard-mitigation-plan

Element A5. Per 44 CFR §201.6(c)(4)(iii), the plan maintenance process shall include a discussion on how the community will continue public participation in the plan maintenance process.

This Plan will be posted on the Door County Website and viewers will be given an opportunity to comment on the Plan at any time by emailing the Emergency Management Department.

Element A6. Per 44 CFR §201.6(c)(4)(i), the plan maintenance process shall include a section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

The county's 2016 plan discussed that the Emergency Management Department was to evaluate the mitigation actions by the three-year anniversary of the plan adoption date. While this is a best practice, no evaluation took place due to the organizational changes that reduced the amount of time to be spent dealing with hazard mitigation as well as the real-time hazards that took place between 2019 and the present.

With this Plan update, the Emergency Management Director expects that a three-year evaluation will take place in approximately mid-2025.

ELEMENT B: RISK ASSESSMENT SUMMARY

FEMA regulations require that a hazard mitigation plan contains a risk assessment regarding the potential impacts of hazards to a community's people, economy, and built and natural environments. For the purpose of hazard mitigation planning, "risk" is the potential for damage, loss, or other impacts created by the interaction of hazards with community assets. Exposure of people, property, and other community assets to hazards can result in disaster, depending on the impacts. Impacts are the consequences or effect of the hazard on community assets. Risk assessment results provide the foundation for the rest of the planning process where action items to reduce risk are identified and prioritized.

The risk assessment conducted for this Plan was based on the state's 2016 plan risk assessment for natural hazards. The state defines a natural hazard as a potential incident resulting from acts of nature (e.g., hurricane, earthquake, tornado, animal disease outbreak, pandemic, or epidemic). The county largely used the same categories as the state, slightly modified, as listed below.

- Severe weather including high winds, tornados, hail, and lightning
- Coastal erosion and flooding
- Drought and extreme heat
- Winter storms and extreme cold

The county used the state's ranking criteria for probability of future events and vulnerability to rank the hazards listed above. This ranking criteria is listed in Appendix B.

The Hazard Summary chart on the following pages addresses the FEMA-required components of a risk assessment, per Title 44 Code of Federal Regulations (CFR) 201.6 for FEMA approval. Listed below are the elements and where they can be found within the chart. Also see Appendix B for a more detailed and narrative description of hazard types, location, extent, and previous occurrences in Door County. Appendix B also lists the community assets discussed in the vulnerability summary found Column 7 of the Hazard Summary chart.

Element B1: Per §201.6(c)(2)(i), the plan shall include a description of the type, location, and extent of all natural hazards that can affect the jurisdiction.

- Column 1 – Hazard Type
- Column 2 – Location/geographic area (# of events)
- Column 3 – Extent (strength or magnitude)

Element B2: Per §201.6(c)(2)(i), the plan shall include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction.

- Column 4 – Previous Occurrences
- Column 5 – Probability of Future Events

Element B3: Per §201.6(c)(2)(ii), the plan shall include a description of each hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction

- Column 6 – Potential Impacts
- Column 7 – Vulnerability Summary. For multi-jurisdictional plans, the risk assessment section must assess each jurisdiction's risk where they vary from the risks facing the entire planning area. The vulnerability summary addresses the structures, systems, populations, or other community assets that are susceptible to damage and loss from hazard events. These community assets can be found in Appendix B.

Element B4: Per §201.6(c)(ii), the plan shall address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods.

There are no NFIP insured structures within the jurisdictions that have been repetitively damaged by floods.

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RISK ASSESSMENT SUMMARY (COLUMNS 1 – 5)

1) Hazard Type B1/ §201.6(c)(2)(i)	**2) Location/geographic area (# of events since 1950)** B1/§201.6(c)(2)(i)	**3) Extent (strength or magnitude)** B1/§201.6(c)(2)(i)	**4) Previous Occurrences** B2/§201.6(c)(2)(i)	**5) Probability of future events** B2/§201.6(c)(2)(i)
Severe Weather, Including Thunderstorms/Lightning/High Winds, Hail, and Tornadoes	Unspecified locations (63 events total) Northern Door (75 events total): • Baileys Harbor (8 events) • Egg Harbor (23 events) • Ephraim (3 events) • Ellison Bay (3 events) • Fish Creek (8 events) • Gibraltar (1 event) • Gills Rock (6 events) • Jacksonport (5 events) • Sister Bay (7 events) • Washington Island (11 events) Central Door (56 events total): • Carlsville (5 events) • Institute (2 events) • Nasewaupee (2 events) • Valmy (4 events) • Sturgeon Bay (43 events) Southern Door (29 events total): • Brussels (10 events) • Forestville (7 events) • Little Sturgeon (1 event) • Maplewood (5 events) • Nasewaupee/airport (5 events)	High Wind: 36 – 68 mph Hail size: .75” – 3” Thunderstorm wind: 0 – 105 mph Tornado 0 – F3, 29.4 total miles	223 events were reported between 01/01/1950 and 08/31/2021 • 115 thunderstorm wind events • 75 hail events • 18 high wind events (no recorded locations) • 8 tornado events • 7 lightning events 160 of these events have recorded locations, listed below. 75 events in Northern Door, 1998 – 2020 • 36 thunderstorm wind events • 33 hail events • 3 lightning events • 3 tornado events 56 events in Central Door, 1994 – 2020 • 35 thunderstorm wind events • 15 hail events • 4 lightning events • 2 tornado events 29 events in Southern Door, 1993 – 2020 • 13 thunderstorm wind events • 13 hail events • 3 tornado events	High probably of future events for everything but tornadoes. Severe weather hazards are generally wide-spread, however, the most incidences have been recorded in Northern and Central Door. Tornadoes are a low-to-medium probability. Between 1956 and 2000, 8 tornado events occurred, including one F3 tornado. The state estimates 0.12 annual tornadoes for Door County.
Coastal Erosion and Flooding	Coastal erosion and flooding along the Green Bay side of the county and pockets of erosion along the Lake Michigan side of the county. Emergency Management Director spoke with the Towns of Clay Banks, Gardner, Liberty Grove, Nasewaupee, and Union regarding flooding issues in those towns and road repair.	According to local reporting of the September 4, 2014 flooding event, parts of the county received seven to eight inches of rain within 24 hours.	One major flood event in 1973. Eight additional flood events (non-major) occurred in Door County between 1982 and 2010. In 2014, a surface water runoff flooding event caused mostly surface runoff flooding and some sewer backup flooding. Villages of Ephraim, Egg Harbor, and Sister Bay and the Towns of Baileys Harbor, Gibraltar, and Liberty Grove. Four lakeshore flood events were recorded between 2019 and 2020, resulting in $80,000 in property damage. For Door County, three heavy rains events were recorded between 2006 and 2008. One indirect death is attributed to a heavy rain event in 2008.	Medium to high probability.

• Drought and Extreme Heat • Winter Storms and Extreme Cold	• County-wide heat and drought • County-wide winter storms and extreme cold	State plan: July 1998, severe drought; Palmer Drought Severity Index -3.00 to -3.99 (severe) US Drought Monitor description for "severe" drought: • Crop or pasture losses likely • Water shortages common • Water restrictions imposed Five wind chill events recorded in NCEI, -18°F or lower.	**Drought and extreme heat:** 29 heat wave days between 1982 and 2015 One excessive heat event was recorded in the NCEI Storm Events database for Door County in 2000. Per the state plan there was a severe drought event In July 1998. The NCEI Storm Events database shows six drought events occurring between 1999 and 2007; one drought was reported in 1999, two in 2005, and three in 2007. **Winter storms:** 99 total events recorded in NCEI between 1996 and 2020. 7 blizzard and 3 ice storm and 119 winter events between 1982 and 2016 (state plan)	High probability. Wisconsin Department of Health Services: Heat Vulnerability Index for Door County ranges from "low" to "moderate": • Washington Island – Low • Northern Door – ~1/3 Moderate & ~2/3 Moderate Low • Central Door – Mostly Moderate • South – ~1/2 Moderate & ~1/2 Moderate Low (Bayside and lakeside is Moderate Low)

RISK ASSESSMENT SUMMARY (COLUMNS 1, 6, & 7)

1) Hazard Type	**6) Potential Impacts** §201.6(c)(2)(ii)	**7) Vulnerability Summary** §201.6(c)(2)(ii). Identification of structures, systems, populations, or other community assets that are susceptible to damage and loss from hazard events

Severe Weather, Including Thunderstorms/Lightning/High Winds, Hail, And Tornadoes	Past losses:
	• People: 1 death and 7 injuries between 1956 and 2020
	• Tornado events:
	  ○ total tornado property damage: $8,017,500
	  ○ total tornado crop damage: $1,770,000
	• Thunderstorm events:
	  ○ total thunderstorm wind property damage: $526,000
	  ○ total thunderstorm crop damage: $500
	• Hail events: total hail crop damage: $3,500,000 (1 event in 2014 in Institute)
	• High wind events: total high wind property damage: $205,000
		High vulnerability People, Economy, Built Environment, and Natural Resources are all vulnerable to severe weather, tornados in particular. Tornados have occurred all areas of the county (3 in Northern Door, 2 in Central Door, and 3 in Southern Door). The state estimates $1.4 million in future annual losses for Door County.
		• Northern Door has the least agricultural land in the county, but the highest number of recorded thunderstorm and hail events. With the largest tourism economy, the visiting population is most vulnerable to severe weather. All municipalities in Door County are equally vulnerable to storm and/or wind events. Northern Door, with over one-half of all the housing units in the county and only one transmission line serving the area, is more vulnerable to power outages. The impacts of power outages include lost economic activity due to businesses not being able to operate properly.
		• Central Door has the only recorded crop damage at $3.5 million. Central Door also has the greatest concentration of manufactured home parks and the highest number of manufactured home units (8 parks, 406 total units).
		• Southern Door has the most agricultural land in the county, but the lowest number of recorded thunderstorm wind and hail events.

Coastal Erosion and Flooding	One major flood event in 1973. Estimated damages for Door County was $24 million. One flash flood event was recorded in 2014, occurring in the Village of Ephraim and was reported to have caused $75,000 in damages. According to local reporting of the September 4, 2014 flooding event, parts of the county received seven to eight inches of rain within 24 hours. At least some of the sewer backup flooding was due to the fact that the power was out for approximately 12 hours. Both types of flooding primarily affected basements, where the large majority of the damage occurred. Door County Emergency Management Services received claims from 61 residents and businesses located	**Coastal Erosion:** High county-wide vulnerability for coastal erosion High-Risk Erosion Zone (0.25 from Coastal Area Boundary): • # Improved Parcels: 7,836 • $ Value of Improvements: $1,617,963,800 Low-Risk Erosion Zone (0.50 miles from Coastal Area Boundary): • # Improved Parcels: 11,267 • $ Value of Improvements: $3,894,553,600 **Flooding:** High vulnerability for lakeshore flooding in some of the towns and low-to-moderate vulnerability for the City and Villages.

1) Hazard Type	6) Potential Impacts §201.6(c)(2)(ii)	7) Vulnerability Summary §201.6(c)(2)(ii). Identification of structures, systems, populations, or other community assets that are susceptible to damage and loss from hazard events
	in the Villages of Ephraim, Egg Harbor, and Sister Bay and the Towns of Baileys Harbor, Gibraltar, and Liberty Grove. Damages claimed ranged in value from a few thousand to a couple hundred thousand dollars.	Northern Door: ○ Acres of improved structures in floodplain/total improved value: 25 ac/$162,046,200 ○ Acres of roads in floodplain and total approximate replacement value: 28 ac/$1,829,520 Central Door: ○ Acres of improved structures in floodplain/total improved value: 32 ac/$103,361,400 ○ Acres of roads in floodplain and total approximate replacement value: 36 ac/$2,352,240 Southern Door: ○ Acres of improved structures in floodplain/total improved value: 46 ac/$33,270,000 ○ Acres of roads in floodplain and total approximate replacement value: 25 ac/$1,633,500 Northern Door has the lowest acreage but the highest improvement value for buildings located within the flood zone at over $1.6 million. Southern Door has the highest acreage but the lowest improvement value for buildings located within the flood zone at over $33.2 million. Central Door is most vulnerable to road flooding with the highest acreage and replacement value at 36 acres and over $2.3 million to replace. The City and Villages of Egg Harbor, Ephraim, and Sister Bay have low- to moderate-vulnerability to flooding, as listed below with total acres and total improved value of building located in the floodplain. City of Sturgeon Bay ○ Acres of roads in floodplain and total approximate replacement value: 20 ac/$263,274 Village of Egg Harbor ○ Acres of roads in floodplain and total approximate replacement value: less than 1 ac/$6,758,500 Village of Ephraim ○ Acres of improved structures in floodplain/total improved value: ~1 ac/$8,284,500 Village of Sister Bay: ○ Acres of improved structures in floodplain/total improved value: less than 1 ac/$1,975,100 See maps in Appendix D for buildings and roads located in the floodplain for the City and Villages.
• Drought and Extreme Heat • Winter Storms and Extreme Cold	A winter storm occurring in 2018 was recorded with $75,000 in damages, likely due to roof collapse. In December of 2000, record or near-record snow depths of 15 to 34 inches occurred in much of the southern part of Wisconsin and counties along Lake Michigan. Fourteen counties, including Door County, received a Presidential Emergency Declaration as a result. In total, these counties received $5,483,097 in federal funds to cover costs associated with snow removal and emergency response efforts.	High vulnerability. All municipalities in Door County are equally vulnerable to extreme temperatures. Extreme temperatures tend to have the greatest impact on the elderly Age 65+ population profiles for Door County by area: Northern Door: • 2020 population estimate: 2,477 • 2040 population projection: 3,068 • 2020 – 2040 # increase: +591 • Percentage increase: +24%

1) Hazard Type	6) Potential Impacts §201.6(c)(2)(ii)	7) Vulnerability Summary §201.6(c)(2)(ii). Identification of structures, systems, populations, or other community assets that are susceptible to damage and loss from hazard events
		Central Door: • 2020 population estimate: 4,565 • 2040 population projection: 5,175 • 2020 – 2040 # increase: +610 • Percentage increase: +13% Southern Door: • 2020 population estimate: 1,583 • 2040 population projection: 1,992 • 2020 – 2040 # increase: +409 • Percentage increase: +26%

ELEMENT C: MITIGATION STRATEGIES

Per FEMA requirements, a hazard mitigation plan must contain goals and action items that represent what the community seeks to achieve through mitigation plan implementation. Mitigation action items are a specific action, project, activity, or process taken to reduce or eliminate long-term risk to people and property from the impact of hazards.

Element C1. Per 44 CFR §201.6(c)(3), the plan shall include a mitigation strategy that provides the jurisdictions' blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs, and resources, and its ability to expand on and improve these existing tools.

See the mitigation action charts below.

Element C2. Per 44 CFR §201.6(c)(3)(ii), the hazard mitigation strategy shall address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate.

All jurisdictions participate in the NFIP program and continue compliance with the program through respective floodplain ordinances.

Element C3. Per 44 CFR §201.6(c)(3)(i), the hazard mitigation strategy shall include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

The planning team approved the state's 2016 plan hazard mitigation goals, as listed below:

Hazard Mitigation Goals (verbatim from the state's 2016 hazard mitigation plan)

- Minimize human, economic, and environmental disruption from natural, technological, and manmade hazards.
- Enhance public education about disaster preparedness and resistance, and expand public awareness of natural, technological, and manmade hazards.
- Encourage hazard mitigation planning.
- Support intergovernmental coordination and cooperation among federal, state, and local authorities regarding hazard mitigation activities.
- Improve the disaster resistance of buildings, structures, and infrastructure whether new construction, expansion, or renovation.

Element C4. Per 44 CFR §201.6(c)(3)(ii), the hazard mitigation strategy shall include a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

See the mitigation action item charts below.

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Element C5. Per 44 CFR §201.6(c)(3)(iii), the hazard mitigation strategy shall include an action plan, describing how the actions identified will be prioritized, implemented, and administered by each local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

See the mitigation action item charts below.

Per 44 CFR §201.6(c)(3)(iv), for multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.
See the mitigation action item charts below.

Element C6. Per 44 CFR §201.6(c)(4)(ii), the plan shall include a process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive plans or capital improvements, when appropriate.

The county will be updating its county-wide comprehensive plan over the next couple of years with adoption of an updated plan by the end of 2023 at the latest. This hazard mitigation will be used as part of that update.

Door County Mitigation Action Items

Mitigation Action Items	Cost-Benefit	Funding	Timeline (on-going/1-5 years/ 5-10 years/10+ years)
Maintain and enhance CodeRed as the single most important source to alert the public to a hazard.	Low Cost / High Benefit	Staff member time	On-going
Continue to prepare and distribute educational materials to the public on severe weather safety procedures. Promote tornado safety public information as well as other summer severe weather public awareness/educational efforts through continued partnership with the National Weather Service. Note: This is part of an annual grant to do severe weather outreach. The grant requires some level of radio/TV advertising, which is being done continuously.	Low Cost / Medium Benefit	Staff member time	On-going
Put together a county-wide tornado shelter list. In the meantime, assist personnel in schools and businesses, public facility managers, and individuals in determining “best available” tornado safety areas.	Low Cost / High Benefit	Staff member time	• 1-5 years • As requested (assistance)
Develop/adopt an emergency flood evacuation plan that includes preparation measures and evacuation instructions to the public. Inventory and assess areas throughout both the rural and urban areas of the county that have repeated flash-flooding problems and identify activities to remediate or rectify problems at those locations.	Medium Cost / Medium Benefit	Staff member time	1 – 5 years
Utilize FEMA floodplain mapping when adopted to update existing flood maps and data sources to better determine areas and facilities susceptible to recurring flooding. Note: per the local NFIP coordinator, FEMA has hired consultants who are working on Door County’s maps, however, the consultant is uncommunicative as to a timeline for those maps.	Low Cost / High Benefit	Staff member time	1 – 5 years
Research/install backup power supply system for county critical facilities. A generator is already installed at Justice Center.	High Cost / High Benefit	Staff member time	1 – 5 years
Inventory and investigate the feasibility of providing safe shelters and signage at state, county, and local parks and recreation areas.	High Cost / High Benefit	Staff member time Federal BRIC Grant	10+ years
Explore developing and maintain a comprehensive safety plan for all county-owned buildings.	Medium Cost / High Benefit	Staff member time	10+ years
Explore collaborating with Soil and Water Conservation Department and the NRCS to expand windbreak planting, such as snow fences or “living snow fences” of trees or other vegetation) to limit blowing and drifting of snow over critical roadway segments.	Low Cost / Medium Benefit	Staff member time	5 – 10 years
Incorporate some hazard mitigation planning, as appropriate, into future updates of the county’s comprehensive and farmland preservation plan. Adopt proactive land use planning methods through the county’s implementation tools such as land use regulations (codes and ordinances).	Low Cost / Medium Benefit	Staff member time	1 – 5 years
Establish/maintain agreements with such entities as local malls, libraries, and schools to serve as heating and cooling centers.	Low Cost / Low Benefit	Staff member time	1 – 5 years
Explore continued use and further development of the county’s Geographic Information System for emergency service purposes. Meet with GIS personnel to discuss how GIS can help establish maps ahead of time for planning purposes.	Low Cost / Low Benefit	Staff member time	On-going
Continue to update information on the Emergency Management Department’s Web site regarding types of hazards and how to respond in the event of a hazard or potential hazard, as well as links to sites with information related to weather conditions, burning practices/regulations, hazardous material spills, etc.	Low Cost / Low Benefit	Staff member time	On-going

Mitigation Action Items	Cost-Benefit	Funding	Timeline (on-going/1-5 years/ 5-10 years/10+ years)
Install lightning protection devices and methods such as lightning rods and grounding on each community's communications infrastructure and other critical facilities. Possibly prioritize those without first vs. newer buildings.	High Cost / Medium Benefit	Staff member time	10+ years
Hazard Mitigation-Related Items and/or Practices the County already has in place and continues to implement/maintain: • Ensures/establishes communication lines between municipalities, police, fire, EMS, hospital/clinics, and highway/street departments. • A backup dispatch console is in place should the 911 call center go down. Brown County is Door County's primary backup at this time, if the system gets overloaded. The major 911 upgrade and tower upgrade all aim to help with this. • Monitors the National Weather Service flood forecasts. • Coordinates public safety, support agencies (such as American Red Cross and United Way), and resource acquisition during emergencies through implementation of the Door County Emergency Operations Plan. • County's highway department plows/salts/sands many roads in the county and is equipped to handle snow storm emergencies. They also continue to trim trees, clear drainage systems, and do other maintenance activities. • Emergency Management disseminates information regarding WisDOT's Flood Damage Aid Program to the towns. This program gives 50% mitigation dollars on top of repairs for damages after an event. • Lightning grade surge protection installed at data centers for critical electronic equipment used for response and recovery. Information Services follows best practices and electrical codes (i.e., proper grounding and UPS protection) when computer infrastructure is installed.	--	--	--

City of Sturgeon Bay Mitigation Action Items (Note: City will be filling in additional cost-benefit, funding, and timeline information)

Mitigation Action Items	Cost-Benefit	Funding	Timeline (on-going/1-5 years/ 5-10 years/10+ years)
Continue to utilize public awareness methods such as radio and television stations and cellphone alerts.	Low Cost / High Benefit	Local	On-going
Continue efforts to improve mobile home safety in windstorms and tornadoes through public education efforts and assistance in locating safe shelter sites and the requirement of tie-downs in mobile home parks.	Low Cost / High Benefit	Local	On-going
Establish/continue tree trimming, drainage system clearance, and other maintenance programs.	Low Cost / High Benefit		On-going
Continue to ensure plowing and salting/sanding equipment is operational and available to handle potential emergencies.	High Cost / High Benefit		On-going
Continue to ensure/establish communication lines between municipalities, police, fire, EMS, hospital/clinics, and highway/street departments.	Low Cost / High Benefit		On-going
Provide sewer back-flow prevention information and other floodproofing measures to communities through public information programs.			
Establish/maintain protective measures such as sandbagging, protection of buildings and other structures, and emergency gas and electricity cut-off procedures.			
Prepare, adopt, and maintain proactive land use planning methods through the county's and municipalities' comprehensive plans and implementation tools such as land use regulations (codes and ordinances) and stormwater management plans.			
Adopt/enforce land use regulations that preserve natural resources adjacent to and in defined floodplains.			1-5 years
Update the stormwater management plan.			
Inventory and assess areas throughout both the rural and urban areas of the county that have repeated flash-flooding problems and identify activities to remediate or rectify problems at those locations. Note: the City is taking measures to rectify problems at certain areas. For instance, the City recently purchased land for a detention pond at Georgia St east of 15th Place to help the repeated flooding that occurs at Georgia/14th. Installation is expected in the next 1-5 years.			
Local Fire Departments, Structural Fire: • Assess building codes and standards that apply to fire protective strategies. • Establish/support community watch programs. • Assess availability to high capacity wells for use in recharging response equipment during fires. • Participate with the County Fire Chiefs Association. • Inventory the details of existing Mutual Aid Agreements.			
Hazard Mitigation-Related Items the City already has in place and continues to implement/maintain: • Installed lightning protection devices and methods such as lightning rods and grounding on communications infrastructure and other critical facilities. • Implements a policy that requires utility companies and development firms to bury power lines in new developments or when upgrades are made to existing lines or rapidly growing trees near power lines. • Installed back-up generators that provide back-up power sources at lift stations to help prevent sewer back-flow flooding. • Utilizes FEMA floodplain mapping to update existing flood maps and data sources to better determine areas and facilities susceptible to recurring flooding.			

Village of Egg Harbor Mitigation Strategies

Mitigation Action Items	Cost-Benefit	Funding	Timeline (on-going/1-5 years/ 5-10 years/10+ years)
Continue to utilize public awareness methods such as radio and television stations and outdoor warning systems.	Low Cost / High Benefit	Local municipal funding	On-going
Install lightning protection devices and methods such as lightning rods and grounding on each community's communications infrastructure and other critical facilities.	High Cost / Medium Benefit	Local municipal funding	10+ years
Develop and maintain a comprehensive safety plan for each publicly-owned building.	Medium Cost / High Benefit	Staff time, local municipal funding	5-10 years
Establish/maintain intergovernmental cooperation agreements with neighboring communities and private vendors to acquire any necessary additional equipment needed for storm clean-up.	Medium Cost / High Benefit	Staff time, local municipal funding	5-10 years
Establish/continue tree trimming, drainage system clearance, and other maintenance programs.	Low Cost / High Benefit	Staff time, local municipal funding	On-going
Encourage utility companies and development firms to bury power lines in new developments or when upgrades are made to existing lines or rapidly growing trees near power lines.	Low Cost / High Benefit	Local municipal funding	On-going for new developments
Continue to ensure plowing and salting/sanding equipment is operational and available to handle potential emergencies.	Medium Cost / High Benefit	Staff time, local municipal funding	On-going
Continue to ensure/establish communication lines between municipalities, police, fire, EMS, hospital/clinics, and highway/street departments.	Low Cost / High Benefit	State funds, local municipal funding	On-going
Collaborate with Soil and Water Conservation Department and the NRCS to expand windbreak planting, such as snow fences or "living snow fences" of trees or other vegetation) to limit blowing and drifting of snow over critical roadway segments.	Medium Cost / High Benefit	Local municipal funding	1-5 years
Provide sewer back-flow prevention information and other floodproofing measures to communities through public information programs.	Low Cost / Medium Benefit	Staff time, local municipal funding	5-10 years
Establish/maintain protective measures such as sandbagging, protection of buildings and other structures, and emergency gas and electricity cut-off procedures.	Medium Cost / Medium Benefit	Staff time, local municipal funding	10+ years
Prepare, adopt, and maintain proactive land use planning methods through the county's and municipalities' comprehensive plans and implementation tools such as land use regulations (codes and ordinances) and stormwater management plans.	Low Cost / High Benefit	Staff time, local municipal funding	On-going
Adopt/enforce land use regulations that preserve natural resources adjacent to and in defined floodplains.	Low Cost / High Benefit	Staff time	On-going
Maintain a stormwater management plan that includes such remediation+ techniques as surface detention basins and in-street detention units.	Medium Cost / High Benefit	Staff time, local municipal funding	5-10 years
Inventory and assess areas throughout both the rural and urban areas of the county that have repeated flash-flooding problems and identify activities to remediate or rectify problems at those locations.	High Cost / Medium Benefit	Staff time, local municipal funding	5-10 years
Utilize FEMA floodplain mapping when adopted to update existing flood maps and data sources to better determine areas and facilities susceptible to recurring flooding.	Low Cost / High benefit	Staff time	On-going
Maintain a stormwater management plan that includes such remediation techniques as surface detention basins and in-street detention units.	Medium Cost / High Benefit	Staff time, local municipal funding	1-5 years

Mitigation Action Items	Cost-Benefit	Funding	Timeline (on-going/1-5 years/ 5-10 years/10+ years)
Implement a rural drainage improvement program that would include ditch, bridge, and culvert maintenance and improvements.	High Cost / Medium Benefit	Staff time, local municipal funding	10+ years
Require, when appropriate, safe and convenient pedestrian, bike, and walking paths, sidewalks, and crosswalks, particularly within dense or community core areas, that connect to residential and commercial areas.	High cost / High Benefit	Local Road Improvement Project Grant, Transportation Alternative Project grant	1-5 years
Address safety and efficiency issues by identifying dangerous intersections, providing adequate traffic controls, assessing lines-of-sight, providing appropriate access points, maintaining a minimum Level of Service (LOS) on all highways and roads, and other appropriate safety/efficiency methods.	Medium Cost / High Benefit	Staff time, Congestion Mitigation & Air Quality Grant	1-5 years
Local Fire Departments, Structural Fire: • Assess building codes and standards that apply to fire protective strategies. • Establish/support community watch programs. • Assess availability to high capacity wells for use in recharging response equipment during fires. • Participate with the County Fire Chiefs Association. • Inventory the details of existing Mutual Aid Agreements.	Low cost / High Benefit	Staff time	On going
Hazard Mitigation-Related Items and/or Practices the Village already has in place and continues to implement/maintain: All Village of Egg Harbor lift stations have back-up generators.	--	--	--

Village of Ephraim Mitigation Strategies

Mitigation Action Items	Cost-Benefit	Funding	Timeline (on-going/1-5 years/ 5-10 years/10+ years)
Continue to utilize public awareness methods such as radio and television stations and outdoor warning systems.	Low Cost / High Benefit	Staff Time	On-Going
Install lightning protection devices and methods such as lightning rods and grounding on each community's communications infrastructure and other critical facilities.	Low Cost / Medium Benefit	Operating Budget/Room Tax	10+
Develop and maintain a comprehensive safety plan for each publicly-owned building.	Medium Cost / Low Benefit	Staff Time	10+
Establish/maintain intergovernmental cooperation agreements with neighboring communities and private vendors to acquire any necessary additional equipment needed for storm clean-up.	Medium Cost / High Benefit (with purchases)	Staff Time	10+
Establish/continue tree trimming, drainage system clearance, and other maintenance programs.	Medium Cost / Medium Benefit	Staff Time/Operational Budget	On-Going
Encourage utility companies and development firms to bury power lines in new developments or when upgrades are made to existing lines or rapidly growing trees near power lines.	Low Cost / Low Benefit	Staff Time	On-Going
Continue to ensure plowing and salting/sanding equipment is operational and available to handle potential emergencies.	High Cost / High Benefit	Staff Time/Operational Budget	On-Going
Continue to ensure/establish communication lines between municipalities, police, fire, EMS, hospital/clinics, and highway/street departments.	High Cost / Low Benefit	Staff Time	On-Going
Collaborate with Soil and Water Conservation Department and the NRCS to expand windbreak planting, such as snow fences or "living snow fences" of trees or other vegetation) to limit blowing and drifting of snow over critical roadway segments.	Low Cost / Medium Benefit (Not a practical issue in Ephraim)	Staff Time	10+
Provide sewer back-flow prevention information and other floodproofing measures to communities through public information programs.	Low Cost / Low Cost	Staff Time	10+
Establish/maintain protective measures such as sandbagging, protection of buildings and other structures, and emergency gas and electricity cut-off procedures.	Low Cost / Medium Benefit	Staff Time/Operational Budget	On-Going
Prepare, adopt, and maintain proactive land use planning methods through the county's and municipalities' comprehensive plans and implementation tools such as land use regulations (codes and ordinances) and stormwater management plans.	Medium Cost / Low Benefit	Staff Time	On-Going
Adopt/enforce land use regulations that preserve natural resources adjacent to and in defined floodplains.	Medium Cost / Low Benefit	Staff Time	On-Going
Maintain a stormwater management plan that includes such remediation+ techniques as surface detention basins and in-street detention units.	Medium Cost / High Benefit	Room Tax/PRAT/State Grants	On-Going
Inventory and assess areas throughout both the rural and urban areas of the county that have repeated flash-flooding problems and identify activities to remediate or rectify problems at those locations.	Medium Cost / Low Benefit	Staff Time	On-Going
Utilize FEMA floodplain mapping when adopted to update existing flood maps and data sources to better determine areas and facilities susceptible to recurring flooding.	High Cost / Low Benefit	Staff Time	On-Going

Mitigation Action Items	Cost-Benefit	Funding	Timeline (on-going/1-5 years/ 5-10 years/10+ years)
Implement a rural drainage improvement program that would include ditch, bridge, and culvert maintenance and improvements.	Low Cost / Medium Benefit	Room Tax/PRAT/State Grants	10+
Require, when appropriate, safe and convenient pedestrian, bike, and walking paths, sidewalks, and crosswalks, particularly within dense or community core areas, that connect to residential and commercial areas.	Medium Cost / Medium Benefit	Room Tax/PRAT/State Grants	On-Going
Address safety and efficiency issues by identifying dangerous intersections, providing adequate traffic controls, assessing lines-of-sight, providing appropriate access points, maintaining a minimum Level of Service (LOS) on all highways and roads, and other appropriate safety/efficiency methods.	High Cost / Low Benefit	Staff Time	On-Going
Local Fire Departments, Structural Fire: • Assess building codes and standards that apply to fire protective strategies. • Establish/support community watch programs. • Assess availability to high capacity wells for use in recharging response equipment during fires. • Participate with the County Fire Chiefs Association. • Inventory the details of existing Mutual Aid Agreements.	High Cost / Low Benefit	Staff Time	On-Going
Hazard Mitigation-Related Items and/or Practices the Village already has in place and continues to implement/maintain: • Ephraim sanitary lift stations, village hall, administrative office and fire station are all equipped with backup generators. • Village buried a large portion of overhead power and communication lines in 2019. • Village installed new stormwater system with detention basins in same 2019 highway project. • Village utilizes FEMA floodplain program.	--	--	--

Village of Sister Bay Mitigation Strategies

Mitigation Action Items	Cost-Benefit	Funding	Timeline (on-going/1-5 years/ 5-10 years/10+ years)
Continue to utilize public awareness methods such as radio and television stations and outdoor warning systems.	High Cost / Medium Benefit	State funding	On-going
Install lightning protection devices and methods such as lightning rods and grounding on each community's communications infrastructure and other critical facilities.	Low Cost / Medium Benefit	State funding/budget	1 – 5 years
Develop and maintain a comprehensive safety plan for each publicly-owned building.	Low Cost / Medium Benefit	Budget	On-going
Establish/maintain intergovernmental cooperation agreements with neighboring communities and private vendors to acquire any necessary additional equipment needed for storm clean-up.	Low Cost / High Benefit	State funding/budget	On-going
Establish/continue tree trimming, drainage system clearance, and other maintenance programs.	Medium Cost / High Benefit	State/federal funding	On-going
Encourage utility companies and development firms to bury power lines in new developments or when upgrades are made to existing lines or rapidly growing trees near power lines.	High Cost / High Benefit	State/federal funding	5 – 10 years/on-going
Continue to ensure plowing and salting/sanding equipment is operational and available to handle potential emergencies.	Medium Cost / High Benefit	Budget	5 – 10 years
Continue to ensure/establish communication lines between municipalities, police, fire, EMS, hospital/clinics, and highway/street departments.	Low Cost / High Benefit	Budget	On-going
Collaborate with Soil and Water Conservation Department and the NRCS to expand windbreak planting, such as snow fences or "living snow fences" of trees or other vegetation) to limit blowing and drifting of snow over critical roadway segments.	Low Cost / Medium Benefit	Federal funding	1-5 years
Provide sewer back-flow prevention information and other floodproofing measures to communities through public information programs.	High Cost / Medium-High Benefit	Budget/state funding	1 – 5 years
Establish/maintain protective measures such as sandbagging, protection of buildings and other structures, and emergency gas and electricity cut-off procedures.	High Cost / Low Benefit	Budget	On-going
Prepare, adopt, and maintain proactive land use planning methods through the county's and municipalities' comprehensive plans and implementation tools such as land use regulations (codes and ordinances) and stormwater management plans.	Medium Cost / Medium Benefit	Budget	On-going/1 – 5 years
Adopt/enforce land use regulations that preserve natural resources adjacent to and in defined floodplains.	Medium Cost / High Benefit	Budget	On-going
Maintain a stormwater management plan that includes such remediation+ techniques as surface detention basins and in-street detention units.	Low Cost / Medium Benefit	Budget	On-going/1 – 5 years
Inventory and assess areas throughout both the rural and urban areas of the county that have repeated flash-flooding problems and identify activities to remediate or rectify problems at those locations.	High Cost / Low Benefit	Budget	1 – 5 years
Utilize FEMA floodplain mapping when adopted to update existing flood maps and data sources to better determine areas and facilities susceptible to recurring flooding.	Medium Cost / High benefit	State/federal funding	1 – 5 years
Maintain a stormwater management plan that includes such remediation techniques as surface detention basins and in-street detention units.	Medium Cost / Medium Benefit	Budget/state funding	On-going

Mitigation Action Items	Cost-Benefit	Funding	Timeline (on-going/1-5 years/ 5-10 years/10+ years)
Implement a rural drainage improvement program that would include ditch, bridge, and culvert maintenance and improvements.	High Cost / Medium Benefit	Budget/state fudning	5 – 10 years
Require, when appropriate, safe and convenient pedestrian, bike, and walking paths, sidewalks, and crosswalks, particularly within dense or community core areas, that connect to residential and commercial areas.	High Cost / High Benefit	State/federal funding	1-5 years
Address safety and efficiency issues by identifying dangerous intersections, providing adequate traffic controls, assessing lines-of-sight, providing appropriate access points, maintaining a minimum Level of Service (LOS) on all highways and roads, and other appropriate safety/efficiency methods.	High Cost / Medium-High Benefit	State funding	1-5 years
Local Fire Departments, Structural Fire: • Assess building codes and standards that apply to fire protective strategies. • Establish/support community watch programs. • Assess availability to high capacity wells for use in recharging response equipment during fires. • Participate with the County Fire Chiefs Association. • Inventory the details of existing Mutual Aid Agreements.	Medium Cost / Medium Benefit	Budget/state funding	1 – 5 years
Hazard Mitigation-Related Items and/or Practices the Village already has in place and continues to implement/maintain: The Village of Sister Bay has back-up power sources at lift stations to help prevent sewer back-flow flooding.	--	--	--

ELEMENT D: PLAN REVIEW, EVALUATION, AND IMPLEMENTATION

Element D1. Per 44 CFR §201.6(d)(3), the plan shall be revised to reflect changes in development.

As of the writing of this plan, US Census 2020 data regarding housing units in Door County has not been released. The Wisconsin Department of Development estimates that the number of housing units in the county grew by 1,635 units, 6.8%, between 2010 and 2020. Also, as of the writing of this Plan, the new FEMA floodplain maps for Door County have not been released and the Wisconsin Department of Natural Resources does not know when they will be released. With these key pieces of data missing at this time, it is difficult to know if the Plan should be revised or how it should be revised to reflect changes in development.

One result of the pandemic is that the county has seen growth in tourism and camping. The county has included a mitigation action item to develop a county-wide list of tornado shelters. The development of a flood emergency evacuation plan is also included in the county's mitigation action items. This will occur after the revised floodplain maps have been received.

Element D2. Per 44 CFR §201.6(d)(3), the plan shall be revised to reflect progress in local mitigation efforts.

Progress in local mitigation efforts are documented in the mitigation action items charts on pp. 14-22. The very last row of the chart for each municipality has a row titled "Hazard Mitigation-Related Items and/or Practices the Village already has in place and continues to implement/maintain."

Element D3. Per 44 CFR §201.6(d)(3), the plan shall be revised to reflect changes in priority.

The mitigation action items provided in the charts on pp. 14-22 have been narrowed down to items more related to the county's scope of work and the Emergency Management Department, in particular. With the lakeshore flooding and COVID pandemic, the Emergency Management Director has been occupied dealing with real-time hazards. The Director also manages the 911 call center at least half-time, leaving less than desired time to deal with potential hazard situations.

The mitigation action items that are being prioritized for this Plan update have the 1 – 5 year timeline category assigned within the last column of the charts.

ELEMENT E: PLAN ADOPTION

Element E1. Per 44 CFR 5201.6(c)(5), the plan shall include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County commissioner, Tribal Council).

Element E2. Per 44 CFR 5201.6(c)(5), tor multi-jurisdictional plans, each jurisdiction requesting approval of the plan must document that it has been formally adopted.

See Appendix E for municipal resolutions formally adopting the Plan.

APPENDIX A: PLANNING PROCESS

Municipal Participation

- City of Sturgeon Bay, Community Development Director – Marty Olejniczak
- Village of Egg Harbor, Administrator – Megan Sawyer
- Village of Ephraim, Administrator – Brent Bristol
- Village of Sister Bay, Administrator – Beau Bernhoft/Janal Suppanz

Signed MOAs will be inserted here.

MEMO

TO: Emergency Management Committee

FROM: Dan Kane, Emergency Management Department
Becky Kerwin, Planner, Land Use Services Department

DATE: February 3, 2021

RE: Door County Hazard Mitigation Plan Update

The current Door County Hazard Mitigation Plan was adopted by the county and certified by the Federal Emergency Management Association (FEMA) in 2016. In order for the county to continue to be eligible for FEMA mitigation project grant funding, this plan is required to be updated every five years to reflect changes in development, progress in local mitigation efforts, and changes in priorities. Door County kicked off this effort in December of last year when the Board of Supervisors approved a grant award from FEMA to conduct this update. (See attached resolution.)

The plan will again be multi-jurisdictional as the county's five incorporated municipalities (City of Sturgeon Bay and Villages of Egg Harbor, Ephraim, Forestville, and Sister Bay) have agreed to participate. Other county departments and outside agencies with an interest in disaster management will also be asked to assist. The update process will again take a countywide approach to evaluating risk from both natural and human-induced disasters, protection of critical facilities, and reduction of costs associated with disasters.

In cooperation with Emergency Management, the Land Use Services Department was invited and agreed to update the plan. Per terms of the FEMA grant, Door County is required to have a final draft submitted to FEMA by December 31st, 2021. More information regarding the plan may be found on the Land Use Services Department's Web site at https://www.co.door.wi.gov/1026/Hazard-Mitigation-Plan.

Please contact Dan Kane or Becky Kerwin at the information above with any questions.

DOOR COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

Multi-Jurisdictional Planning Meeting Notes

9:00 a.m. – 10:00 a.m., June 10th, 2021

In Attendance

In-person:

Door County:

- Dan Kane, Director, Emergency Management Department
- Mariah Goode, Director, Land Use Services Department
- Becky Kerwin, Planner, Land Use Services Department

City of Sturgeon Bay: Marty Olejniczak, Community Development Director

Virtual:

Village of Egg Harbor: Megan Sawyer, Administrator

Village of Ephraim: Brent Bristol, Administrator

Village of Sister Bay: Beau Bernhoft, Administrator

Handouts

- Memorandum of Agreement
- Wisconsin Hazard Mitigation Plan, 2016 – natural hazard threat rankings and criteria used for ranking
- community capabilities worksheet from the FEMA hazard mitigation planning handbook
- community capabilities chart, summary of the county's 2016 plan capabilities
- community assets by Northern Door, Central Door, and Southern Door
- maps of buildings located within the 100 year flood zone and road markers below the base flood elevation
- mitigation strategies by agency

Notes

Dan Kane kicked off the meeting with a few comments about the planning grant awarded and reasons for the County, City, and Villages to have a FEMA-approved hazard mitigation plan, including eligibility to receive federal hazard mitigation grant funding, both pre- and post-disaster.

Prior to the meeting, Kerwin had emailed the City and four Villages the meeting handouts listed above. Kerwin discussed how the state's Wisconsin Emergency Management (WEM) Department had done a review in 2020 of the county's 2016 plan, which resulted in comments for the county to incorporate into its 2021 plan update. Those comments would be addressed throughout the meeting.

Kerwin also discussed how state had developed/adopted its 2016 plan shortly after the county had already done its 2016 plan. She noted that it might make sense to mimic the state's 2016 plan to the extent reasonable for this update, but to also incorporate any local differences. Kerwin reviewed the handout with the six natural hazards contained in the state's plan and explained their ranking process for he hazard's threat to the state. Per FEMA, a hazard's threat can be evaluated by considering the hazard's probability of occurrence, a community's vulnerability to the hazard, and the hazard's mitigation potential. Also included in the natural hazards handout were the state's ranking criteria for the three FEMA-defined threat categories.

Committee members were asked to notate on the state's natural hazard threats handout whether or not they thought the hazard poses significant threat to Door County and whether or not they concur with the state's rankings of the three threat categories for each of the six natural hazards.

The Committee also discussed the merits of including non-natural hazards in the plan. The county's 2016 plan included non-natural hazards, however, it is not a requirement for becoming a FEMA-certified plan. The Committee agreed to keep the descriptions of the non-natural hazards from the 2016 plan in the 2021 plan update, incorporate any additional updates, and to check with WEM to see if mitigation strategies related to non-natural hazards are required to be in the plan in order to receive any potential funding in the event a described non-natural hazard occurs.

Kerwin discussed next the blank "community capabilities" worksheet from the FEMA hazard mitigation planning guide book that asks about municipal planning and regulatory, administrative and technical, financial, and education and outreach resources. Kerwin also reviewed the community capabilities chart hand out that lists the same question categories followed by the capabilities that were reported by the municipalities for each category for the 2016 plan. Committee members were instructed to review the 2016 capabilities chart handout and notate any changes.

Next, Kerwin discussed the community assets handout which lists assets related to people, the economy, the built environment, and the natural environment, grouped by Northern Door, Central Door, and Southern Door. The Villages of Egg Harbor, Ephraim, and Sister Bay and the Towns of Baileys Harbor, Egg Harbor, Gibraltar, Jacksonport, Liberty Grove, and Washington Island are grouped together under Northern Door. The City of Sturgeon Bay and the Towns of Nasewaupee, Sevastopol, and Sturgeon Bay are grouped together under Central Door. The Village of Forestville and the Towns of Brussels, Clay Banks, Forestville, Gardner, and Union are grouped together under Southern Door. Members were asked to review their municipal-specific assets, but also to look at the Town information for accuracy.

Kerwin also discussed maps she created showing buildings located within the 100-year floodplain and road points identified to be below the base flood elevation. Committee members were asked to review the accuracy of the maps and to notate any buildings critical to either preventing hazards or recovering from hazards.

Lastly, Kerwin discussed the mitigation strategy handout containing the strategies from the 2016 plan and WEM's comments regarding those strategies Kerwin pointed out WEM's comments regarding the need to make the mitigation strategies "clear, concrete, and enforceable" and asked that Committee members keep that in mind when reviewing their strategies.

The Committee members agreed that the handouts with their comments notated would be returned to Kerwin no later than Friday, July 30th. The Committee also scheduled the next meeting for 9:00 a.m., Friday, August 13th.

The Committee agreed to end the meeting at 9:40 a.m.

RYK

June 14th, 2021

DOOR COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

Multi-Jurisdictional Planning Meeting Notes

9:00 a.m. – 10:00 a.m., August 13th, 2021

In Attendance

In-person:

Door County:

- Dan Kane, Director, Emergency Management Department
- Mariah Goode, Director, Land Use Services Department
- Becky Kerwin, Planner, Land Use Services Department

Virtual:

City of Sturgeon Bay: Marty Olejniczak, Community Development Director

Village of Egg Harbor: Megan Sawyer, Administrator

Village of Ephraim: Brent Bristol, Administrator

Handout:

Each municipality representative was emailed a mitigation action item chart specific to their municipality prior to the meeting.

Notes

Kerwin reviewed the mitigation action item charts that were previously emailed to the City and Villlage representatives. These charts contain action items from the 2016 plan and WEM's comments regarding those strategies Kerwin pointed out WEM's comments regarding the need to make the mitigation strategies "clear, concrete, and enforceable" and asked that Committee members keep that in mind when reviewing their strategies. More specific instructions given are described below:

- **Cost-Benefit (3rd column).** Assign high/medium/low for both cost and benefit. For example: "Continue to utilize public awareness methods such as radio and television stations and outdoor warning systems." Cost-Benefit: low-cost – high-benefit (or low/high).
- **Timeline (5th column).** Please use one of the following categories: on-going/1-5 years/5-10 years/10+ years.
- **The last row in the chart, "Hazard mitigation-related Items the municipality already has in place and continues to implement/maintain."** The City has the most items in this field, please take a look and see if there are items that your municipality is doing that should also be listed in your chart. You may also add any items that are not listed anywhere. There is only one item in this field for Egg Harbor and Sister Bay (back-up generators at lift stations) and none for Ephraim.
- **The last section of the document, "Action items not included in the chart above to potentially be deleted."** Please note agreement to delete or that you would like to keep the item in the plan. If kept in the plan, note also a cost-benefit, funding source, and timeline.

The Committee members agreed that the handouts with their comments notated would be returned to Kerwin no later than Tuesday, September 7th.

The Committee agreed to end the meeting at approximately 9:30 a.m.

RYK/August 13th, 2021

APPENDIX B: RISK ASSESSMENT DOCUMENTS

PROBABILITY AND VULNERABILITY RANKING CRITERIA

Probability Ranking Criteria

High

- The hazard has impacted the state annually, or more frequently
- The hazard is widespread, generally affecting regions or multiple counties in each event
- There is a reliable methodology for identifying events and locations

Medium

- The hazard impacts the state occasionally, but not annually
- The hazard is somewhat localized, affecting only relatively small or isolated areas when it occurs
- The methodology for identifying events is not well-established, or is not applied across the entire state

Low

- The hazard impacts the state occasionally, but not annually
- The hazard is somewhat localized, affecting only relatively small or isolated areas when it occurs
- The methodology for identifying events is not well-established, or is not applied across the entire state

Vulnerability Ranking Criteria

High

- Minimal countermeasures are in place to prevent or protect against this hazard.
- Countermeasures may have potential, but limited demonstrated history in reducing the threat potential.
- The nature of the hazard may limit the availability of countermeasures.

Medium

- Multiple measures are in place to prevent or protect against this hazard.
- Countermeasures have been tested and have demonstrated success in reducing the threat potential.

Low

- Multiple, reliable, well-coordinated, countermeasures are in place to prevent or protect against this hazard.
- Countermeasures have an extensive demonstrated history of testing and success in significantly reducing the threat potential.

NATURAL HAZARD TYPES AND DESCRIPTIONS

Per Federal Emergency Management Agency (FEMA) requirements for hazard mitigation plan content, this section describes natural hazards that pose a threat to the county. The natural hazard profiles are primarily based on information from the National Oceanic Atmospheric Administration and the state's hazard mitigation plan.

SEVERE WEATHER, INCLUDING THUNDERSTORMS/LIGHTNING/HIGH WINDS, HAIL, AND TORNADOES

Severe weather can occur throughout Wisconsin during any month of the year, but the highest frequency is from May through September. June has the highest frequency of tornadoes, followed by July, May, and August. February is the only month with no documented tornadoes in Wisconsin. Hail also materializes more often during the warmer months with 85% occurring between May and September. Thunderstorms occur most often between noon and 10 pm with 75% of tornadoes occurring between 3 and 10 pm. The peak hour for severe thunderstorms and tornadoes is 6 to 7 pm.

See below for brief descriptions of severe weather types and occurrences in Door County.

Thunderstorms/Lightning/High Wind

Thunderstorm events are generated by an upward motion of unstable air (convection) that contains a high amount of moisture. They are characterized by heavy rain; high winds, downbursts, and tornadoes; hail; and lightning. Occasionally, thunderstorms occur in winter during heavy snow events. Typically, Wisconsin thunderstorms are approximately 15 miles across and last for about 30 minutes, but events of longer duration or with high rates of precipitation can lead to flooding. The National Weather Service (NWS) classifies a thunderstorm as severe if one or more of the following conditions are met:

1. Winds reach or exceed 58 mph
2. The storm produces a tornado
3. The storm produces hail at least one inch in diameter
4. Flash flooding occurs

A byproduct of a thunderstorm is lightning. The action of rising and descending air in a thunderstorm separates positive and negative charges, with lightning the result of the buildup and discharge of energy between positive and negative charge areas. Water and ice particles may also affect the distribution of the electrical charge. In only a few millionths of a second, the air in a lightning strike is heated to 50,000°F, a temperature five times hotter than the surface of the sun. The heated air expands so rapidly that it causes a shock wave known as thunder.

Wisconsin experiences from two to five severe thunderstorm wind events per year, on average. Door County is on the low end of this range, averaging between two and three severe thunderstorm wind events per year.

Lightning can travel between clouds (cloud-to-cloud), from one point to another within one cloud (intra-cloud), from a cloud to the air surrounding the storm (cloud-to-air), from a cloud to the ground (cloud-to-ground), or from the ground to a cloud (ground-to-cloud). The first four types are considered natural lightning because they occur naturally in the environment. Ground-to-cloud lightning is considered artificially-initiated or triggered lightning because it strikes human-made objects like airplanes, rockets, very tall structures, and structures on mountains.

According to the NWS, on average, about 25 million cloud-to-ground strikes are detected in the continental US annually, with about half of all flashes contacting more than one ground point. In addition, there are roughly five to ten times as many cloud-to-cloud flashes as there are cloud-to-ground flashes.

The hazard posed by lightning is significantly underrated. After floods, lightning kills the most people on average each year. High winds, rainfall, and a darkening cloud cover are warning signs for possible cloud-to-

ground lightning strikes. While many lightning casualties happen at the onset of a storm, more than half of lightning deaths occur after a thunderstorm has passed. The lightning threat diminishes after the last sound of thunder, but may persist for more than 30 minutes. When thunderstorms are in the area, but not overhead, the lightning threat can exist when skies are clear. Lightning has been known to strike ten miles or more from the storm in an area with clear sky above. Large outdoor gatherings are particularly vulnerable to lightning strikes that could result in injuries and deaths. This vulnerability underscores the importance of developing site-specific emergency procedures for these types of events with particular emphasis on adequate early warning.

A “lightning” event may be recorded in the Storm Events database when a sudden electrical discharge from a thunderstorm results in a fatality, injury, and/or damage. Between 1997 and 2016, seven lightning events were recorded for Door County, including one injury and $594,700 in property damage.

When a thunderstorm became severe in Wisconsin during the period between 1982 and 2010, it was in the following form:

- damaging high wind 58% of the time,
- large hail 30% of the time,
- tornados 7% of the time, and
- flash floods from heavy rain 5% of the time.

Lightning occurs with most severe thunderstorms, but does not always produce damages. The probability of lightning itself occurring is quite high, due to the high number of severe thunderstorms in the state; however, the site-specific incidence of lightning is considered low because of the localized nature of the hazard.

Hail

Hail can also develop in thunderstorms when strong currents of rising air, known as updrafts, carry water droplets high within the storm, exposing these droplets to cold air and freezing them. As the frozen droplets begin to fall toward the ground, rising currents within the storm lift them again. The hailstones gain an ice layer and grow increasingly larger with each ascent. Eventually the hailstones become too heavy for the updraft to support, and they fall to the ground.

NCEI describes hail as frozen precipitation in the form of balls or irregular lumps of ice.

Though hail typically accompanies severe thunderstorms, all strong thunderstorms have the potential to produce hailstones. The size of hailstones varies and is a direct consequence of the severity and size of the thunderstorm; greater instability in the atmosphere causes stronger updrafts. Stronger updrafts can keep hailstones suspended for longer periods of time, resulting in larger hailstones at ground level. Severe hail is considered 0.75 inches in diameter (the size of a penny) or greater. Hailstorms can occur throughout the year, however, most hail events occur between April and October.

Hail can cause extensive crop and property damage, particularly during the months May through September when approximately 85% of hailstorms occur. This timeframe coincides with the growing and harvesting seasons for many of Wisconsin’s crops, causing economic losses and damages for the agriculture industry. Between 1963 and 2020, 75 hail events were recorded for Door County. (See list below for locations. Note that not all recorded hail events have a location.) One hail event occurring in 2014 in Sturgeon Bay caused $3.5 million in crop damage. The largest hail size recorded for the county was 3”, occurring in 2000, also in Sturgeon Bay.

Hail event locations:

- 33 hail events in Northern Door
- 15 hail events in Central Door
- 13 hail events in Southern Door

Tornados

A tornado is a violently rotating column of air (vortex) extending from the base of a convective cloud (usually cumulonimbus) to the ground. Tornadoes form in many parts of the world under many types of conditions; however, the most common conditions in Wisconsin are intense squall lines and supercell thunderstorms. Tornadoes can be classified as supercell or nonsupercell. Supercell tornadoes are derived from supercell thunderstorms of which a key component is a rotating updraft. These tornadoes can be devastating. Non-supercell tornadoes are formed by a spinning column of air near the ground and tend to be short-lived and weaker than supercell tornadoes. Non-supercell tornadoes include gustnadoes, land spouts, and water spouts. Most tornadoes in the US last less than ten minutes, but can exist for more than an hour. (NOAA, Storm Prediction Center) The path of a tornado can range from a few hundred feet to miles and tornado widths may range from tens of yards to a mile or two.

The table below shows a well-recognized scale for tornado strength, the Enhanced Fujita Tornado Scale.

Enhanced Fujita (EF) Tornado Scale

Category	EF-Scale Wind Speed (mph)
EF0 (weak)	65 – 85 mph
EF1 (weak)	86 – 110 mph
EF2 (strong)	111 – 135 mph
EF3 (strong)	136 – 165 mph
EF4 (violent)	166 – 200 mph
EF5 (violent)	>200 mph

Source: NOAA National Weather Service, Milwaukee/Sullivan, WI, 2011.

NOAA Storm Events Database Search Results for Door County, Wisconsin
Event Types: Hail, High Wind, Lightning, Thunderstorm Wind, Tornado

Between 1956 and 2000, eight tornados were recorded in the Storm Events database for Door County with approximately $8.8 million in total damages an average of $1.1 million in damages per tornado. The most serious tornado occurred in 1998, which was given an EF3 ranking and was responsible for two injuries, over $4.7 million in property damages, and over $1.7 million in crop damages. The second worst tornado event occurred in 1970 when two EF2 tornados occurred on the same day, causing two injuries and $500,000 in property damages. The table below lists all tornado events recorded for Door County.

Tornado Events, Door County

Date	Time	F-Scale	# Direct Injuries	$ Property Damage	$ Crop Damage	Length (miles)	Width (yards)
7/1/1956	12:05 p.m.	F2	0	$250,000	$0	10.6	50
7/25/1966	6:20 p.m.	F0	0	$2,500	$0	2	17
4/22/1970	9:10 p.m.	F2	2	$250,000	$0	2.3	500
4/22/1970	9:30 p.m.	F2	0	$250,000	$0	4.3	500
7/12/1973	7:30 a.m.	F1	0	$25,000	$0	0	100
6/8/1985	8:00 p.m.	F2	0	$2,500,000	$0	5	150
8/23/1998	5:30 p.m.	F3	2	$4,740,000	$1,770,000	5.1	1,300
7/13/2000	2:55 p.m.	F0	0	$0	$0	0.1	50

Source: National Oceanic Atmospheric Administration, Storm Events - National Centers for Environmental Data, June, 2015.

The state's hazard mitigation plan estimates the annual probability of a tornado and associated dollar value of damage for all counties in Wisconsin. The state estimates 0.12 annual tornadoes with $1.4 million in future annual losses. Compared to other counties, Door County is a low-risk area for tornados; Dane County has the highest probability at 0.95 estimated annual tornados.

WINTER STORMS AND EXTREME COLD

A variety of weather phenomena and conditions can occur during winter storms. The following are

National Weather Service-approved descriptions of winter storm elements:

- Heavy snowfall. Accumulation of six or more inches of snow in a twelve-hour period or eight or more inches in a 24-hour period.
- Blizzard. Sustained wind speeds or frequent wind gusts of at least 35 mph accompanied by heavy snowfall or large amounts of blowing or drifting snow.
- Ice storm. Rain freezing upon contact with the ground and/or exposed objects near the ground; at least ¼ inch of ice must accumulate within twelve hours.
- Freezing drizzle/freezing rain. Drizzle or rain freezes upon impact on objects with a temperature of 32ºF or below.
- Sleet. Solid grains or pellets of ice formed by the freezing of raindrops or the refreezing of largely melted snowflakes; does not cling to surfaces.

The combination of extremely cold temperatures and strong winds can result in wind chills that cause bodily injury such as frostbite and death due to exposure (hypothermia). Wind chill is an apparent temperature describing the combined effect of wind and low air temperatures on exposed skin; measurement is based on the rate of heat loss from exposed skin. A temperature of 0ºF combined with a 15 mph wind results in a wind chill temperature of -19ºF. At this wind chill temperature, exposed skin can freeze in 30 minutes. In general, the National Weather Service regional offices issue Wind Chill Advisories for Wisconsin when wind chill values are expected to drop to -20 to -34ºF with winds 10 mph or higher. Similarly, the National Weather Service issues Wind Chill Warnings when wind chill values are expected to drop to -35ºF or lower with winds 10 mph or higher.

NCEI criteria for its seven categories of severe winter weather are listed below. Listed within each category are the number of events that occurred in Door County and the first and last years of the event's occurrence. A total of 99 events were recorded between 1996 and 2020. Any additional information regarding a type of event from the state's hazard mitigation plan is listed following the NCEI information

- Winter Storm. A winter weather event which has more than one significant hazard (i.e., heavy snow and blowing snow; snow and ice; snow and sleet; sleet and ice; or snow, sleet, and ice) and meets or exceeds locally/regionally defined 12 and/or 24 hour warning criteria for at least one of the precipitation elements, on a widespread or localized basis. Normally, a winter storm would pose a threat to life or property. For Door County, 44 winter storm events were recorded between 1996 and 2021. A winter storm occurring in 2018 was recorded with $75,000 in damages, likely due to roof collapse.
- Heavy Snow. Snow accumulation meeting or exceeding locally/regionally defined 12 and/or 24 hour warning criteria, on a widespread or localized basis. This could mean such values as 4, 6, or 8 inches or more in 12 hours or less; or 6, 8, or 10 inches in 24 hours or less. In some heavy snow events, structural damage, due to the excessive weight of snow accumulations, may occur in the few days following the meteorological end of the event.

  Compared to the rest of the state, Door County has a lower probability of heavy snowfall, since heavy snowfalls are more likely to occur in northern Wisconsin in counties along Lake Superior. For Door County, 34 heavy snow events were recorded between 1996 and 2020. Door County's average seasonal snowfall between 1971 and 2000 was between 40 and 50 inches. In December of 2000, record or near-record snow depths of 15 to 34 inches occurred in much of the southern part of Wisconsin and counties along Lake Michigan. Fourteen counties, including Door County, received a Presidential Emergency Declaration as a result. In total, these counties received $5,483,097 in federal funds to cover costs associated with snow removal and emergency response efforts.
- Blizzard. A winter storm which produces the following conditions for 3 hours or longer on a widespread or localized basis: (1) sustained winds or frequent gusts 35 mph or greater and (2) falling and/or blowing snow reducing visibility frequently to less than 1/4 mile, on a widespread or localized basis. In Wisconsin, blizzards are more likely to occur in the eastern counties along Lake Michigan, including Door County. For Door County, seven blizzard events were recorded between 1996 and 2018.

- Winter Weather. A winter precipitation event that causes a death, injury, or a significant impact to commerce or transportation but does not meet locally/regionally defined warning criteria. A winter weather event could result from one or more winter precipitation types (snow, or blowing/drifting snow, or freezing rain/drizzle), on a widespread or localized basis. For Door County, four winter weather events were recorded between 1996 and 1997.
- Ice Storm. Ice accretion meeting or exceeding locally/regionally defined warning criteria (typical value is ¼ or ½ inch or more), on a widespread or localized basis. For Door County, one ice storm event was recorded in 1996. (Note that the state's hazard mitigation plan reports three ice storms having occurred in Door County between 1982 and 2010.)
- Extreme Cold/Wind Chill. Extreme cold/wind chill is a period of extremely low temperatures or wind chill temperatures reaching or exceeding locally/regionally defined warning criteria (typical value around-35°F or colder), on a widespread or localized basis. For Door County, four events were recorded in the Storm Events database between 2008 and 2014.
- Cold/Wind Chill. Cold/wind chill is a period of low temperatures or wind chill temperatures reaching or exceeding locally/regionally defined advisory (typical value is -18°F or colder) conditions, on a widespread or localized basis. A combination of seasonably cold temperatures and low wind chill values (roughly 15°F below normal) is counted as a cold/wind chill event when it is the primary cause of death, as determined by a medical examiner. For Door County, five cold/wind chill events were recorded between 1996 and 2019.

FLOODING

Note: unless otherwise noted, the information on flooding below is copied from the state's hazard mitigation plan, with some minor editing.

Flooding, as defined by the National Flood Insurance Program, is "a general and temporary condition where two or more acres of normally dry land or two or more properties are inundated by water or mudflow." Floods specifically affect floodplains, the lowlands adjacent to water bodies. Floods are natural events that are considered hazards only when people and/or property are affected. Nationwide, hundreds of flood hazard events occur each year, making it one of the most common hazards in all 50 states and U.S. territories.

While most flood events are not declared a Presidential Disaster, many get classified as a major flood event. Major flooding, as defined by the National Weather Service, involves extensive inundation of structures and roads and significant evacuations of people and/or transfer of property to higher elevations. A Flood Warning is issued if major flooding is expected during the event. Examples of conditions that would be considered major flooding include:

- many buildings flooded, some with substantial damage or destruction
- infrastructure destroyed or rendered useless for an extended period of time
- multiple homes are flooded or moved off foundations
- everyone in threatened area is asked to evacuate
- National Guard units assist in evacuation efforts
- erosion problems are extreme
- airstrip, fuel tanks, and the generator station are likely flooded
- loss of transportation access, communication, power and/or fuel spills are likely
- fuel tanks may float and spill and possibly float downstream
- ice chunks floating through town that could cause structural damage

- high damage estimates and high degree of danger to residents

Per FEMA, the most widely adopted design and regulatory standard for floods in the United States is the one-percent annual chance flood (base flood or 100-year flood), which has a one-percent chance of occurring in any particular year. This measure is a simple and general way to express the statistical likelihood of a flood; actual recurrence periods vary from place to place. Smaller floods occur more often than larger, deeper, and more widespread floods. Thus, a "10- year" flood has a greater likelihood of occurring than a "100- year" flood. Table 2.6 below shows a range of flood recurrence intervals and their probabilities of occurrence.

Flood Recurrence Intervals

Occurrence	Annual Percent Chance of
10-year	10.0%
50-year	2.0%
100-year	1.0%
500-year	0.2%

Source: Federal Emergency Management Administration

Coastal flooding occurs when excess water from precipitation, snowmelt, or storm surges overflows onto the shore. Storm surges cause a temporary rise in water level due to storm winds blowing across open water. The duration of the surge depends on how long the storm lasts; some surges can persist for an entire day.

At the federal level, collaboration between FEMA and the US Army Corps of Engineers (USACE) on the Great Lakes Coastal Flood Study will soon bring coastal V Zones to the Great Lakes. Zones V and VE represent the area along the coast that is subject to inundation by the one percent-annual-chance flood event with additional hazards associated with storm-induced waves. Base flood elevations (BFEs) have been determined through hydraulic analysis in VE Zones, while this data does not exist for V Zones.

Flood insurance is required for V and VE Zone structures, and floodplain management standards must be enacted in these areas. FEMA also requires V Zone structures to be elevated on pilings. It is not yet known how this requirement will be fulfilled in Wisconsin, where state law prohibits elevating structures on anything except fill, and where ice has the potential to cause severe damage during winter coastal storms.

A major flood event in 1973 affected 35 counties in the state, including Door County. Estimated damages for Door County was $24 million. Eight additional flood events (non-major) occurred in Door County between 1982 and 2010. In 2014, a surface water runoff flooding event took place as described in a FEMA flood-related document and summarized below.

According to local reporting of the September 4, 2014 flooding event, parts of the county received seven to eight inches of rain within 24 hours, causing mostly surface runoff flooding and some sewer backup flooding. At least some of the sewer backup flooding was due to the fact that the power was out for approximately 12 hours. Both types of flooding primarily affected basements, where the large majority of the damage occurred. Door County Emergency Management Services received claims from 61 residents and businesses located in the Villages of Ephraim, Egg Harbor, and Sister Bay and the Towns of Baileys Harbor, Gibraltar, and Liberty Grove. Damages claimed ranged in value from a few thousand to a couple hundred thousand dollars.

The NCEI Storm Events database categories included in this section are heavy rain, flooding, and flash flooding. Note that there is no stormwater flooding category in the database.

- Lakeshore Flood. Flooding of lakeshore areas due to the vertical rise of water above normal level caused by strong, persistent onshore wind and/or low atmospheric pressure, resulting in damage, erosion, flooding, fatalities, or injuries. Lakeshore areas are defined as those portions of land zones (coastal county/parish) adjacent to the waters of the Great Lakes and other lakes with specific assigned

Marine Zones. Four lakeshore flood events were recorded between 2019 and 2020, resulting in $80,000 in property damage.

- Heavy Rain. Heavy rain is an unusually large amount of rain which does not cause a flash flood or flood, but causes damage, e.g., roof collapse or other human/economic impact. Heavy rain resulting in urban and/or small stream flooding is also classified as a heavy rain event. For Door County, three heavy rains events were recorded between 2006 and 2008. One indirect death is attributed to a heavy rain event in 2008.
- Flood. A flood is any event with a high flow, overflow, or inundation by water which causes or threatens damage. In general, this would mean the inundation of a normally dry area caused by an increased water level in an established watercourse, or ponding of water, generally occurring more than six hours after the causative event, and posing a threat to life or property. This can be on a widespread or localized basis. One flood event was recorded for Door County in 1996.
- Flash Flood. A flash flood is a rapid and extreme flow of high water into a normally dry area, or a rapid water level rise in a stream or creek above a predetermined flood level, beginning within six hours of the causative event (e.g., intense rainfall, dam failure, ice jam-related), on a widespread or localized basis. Ongoing flooding can intensify to flash flooding in cases where intense rainfall results in a rapid surge of rising flood waters. Flash floods typically only exist for a day or two.

  One flash flood event was recorded in 2014 (September 4th), occurring in the Village of Ephraim and was reported to have caused $75,000 in damages.

The maps in Appendix D illustrate areas mapped by FEMA within the City and three villages as being potentially located in the 100-year floodplain as well as buildings and roads located within those floodplain areas. The Village Sister Bay is not participating in the NFIP program because flooding is not perceived to be a major risk.

COASTAL EROSION AND BLUFF FAILURE

Coastal erosion is defined as the wearing away of land or a lakebed. Erosion leads to the loss or displacement of material along coastlines, beaches, or dunes over a period of time, and can be influenced by both natural coastal processes and human activities.

Natural processes:

- Lake level changes
- Currents and tides
- Waves and storm surges
- Wind
- Flooding
- Orientation of shoreline
- Sediment influx
- Littoral processes
- Ice floes
- Overwash
- Freeze/thaw cycle

Human activities:

- Dredging
- Jetty and groin construction
- Seawalls and shoreline hardening
- Revetments
- Beach nourishment
- Boat wakes
- Construction of harbors
- Construction of sediment trapping
- Dams in river tributaries

The rate at which coastal erosion occurs is dependent on a complex web of factors. Cyclical changes in lake levels, disruption of beach-building material transport, and storms all influence the rate of erosion. Annual variability in wave climate and lake levels causes the rates of bluff and dune erosion along the shores of the Great Lakes to vary from near zero to tens of feet per year (National Research Council, 1990). Erosion rates can increase as a result of elevated groundwater levels, increased loads on bluff tops, loss of vegetation on slopes, or overland runoff. Lake ice running up onto the shore due to thawing or wave action can also exacerbate coastal erosion by damaging shore structures, removing vegetation, transporting sand, rock, and other debris, and eroding the base of steep banks, rendering them unstable and subject to landslides.

Note that “coastal erosion” is not a category within the NCEI Storm Events database.

Coastal erosion is the wearing away of land and the loss of or displacement of lands along coastlines, beaches, or dune material over a period of time as a result of natural coastal processes or human influences. Natural processes and human influences affecting coastal erosion are listed below.

Natural processes:

- lake level change
- currents
- tides
- waves and storm surges
- winds
- flooding
- orientation of shoreline
- sediment influx
- littoral processes
- ice floes
- overwash

Human influences:

- dredging
- jetty and groin construction
- hardening shorelines with seawalls
- revetments
- beach nourishment
- boat wakes
- construction of harbors
- construction of sediment-trapping dams in the river tributaries

Rates of bluff and dune erosion along the shores of the Great Lakes vary from no erosion to tens of feet per year due to annual variability in wave climate and lake levels. Times of high water or wave action accelerate the erosion process, with bluff erosion more likely to occur during major storm events as a result of increased wave action on the shoreline. The effects of wave-induced erosion are usually greater during periods of high water-levels. Other significant factors contributing to shoreline erosion involve the movement of beach sediments for navigational improvements and shoreline structures and some dredge-material disposal practices that deplete both tributary and shoreland sources of sediment.

The state's hazard mitigation plan describes all of Wisconsin's 15 coastal counties as experiencing bluff erosion, coastal flooding, fluctuating water levels, and damage to shoreline structures. Additionally, the Wisconsin Coastal Management Program's "Needs Assessment and Strategy, 2011-2015" describes the 185 miles of shoreline from southern-most Kenosha County to the Sturgeon Bay Canal as being the most vulnerable, as well as the northeastern part of Brown County. The report describes erosion along the remainder of the Lake Michigan shore (from the Sturgeon Bay Canal in Door County to Green Bay) as limited to smaller segments of bays and clay banks.

According to the Wisconsin Initiative on Climate Change Impacts report, the state's coastal regions will face unique challenges due to lower water levels, with Lake Michigan's average water level predicted to decrease by about a foot by the end of the century. Additionally, reduced ice cover due to warmer temperatures, combined with an increase in wind strength, will expose shorelines to larger waves for longer periods of time, resulting in shoreline erosion. Predicted immoderate rain events will make shorelines exceedingly vulnerable to erosion as the soil will retain moisture more of the time, making it unstable and inordinately prone to erosion. Shoreline erosion eventually leads to shoreline recession, the change in distance from a shoreline feature's original position to the eroded position, the most visible aspect of erosion. However, recession does not immediately follow erosion and can take years to occur. Shoreline damage can also occur with fluctuating water levels and excessive wave impact. As waves down-cut the lakebed during low-water times, shoreline erosion happens more quickly; then when water levels rise again, waves can reach further inland and lead to shoreline damage.

The state's hazard mitigation plan includes a risk assessment that estimates losses from coastal erosion. The erosion risk zones are based on distance in miles from coastal water (coastal area boundary), with the high-risk erosion zone defined as ¼ mile from coastal water and the low-risk erosion zone defined as ¼ to ½ mile from coastal water.

The table below shows the state's loss estimation for the high-risk and low-risk erosion zones. Door County has a total of 7,836 improved parcels subject to high-risk erosion, the highest in the state, valued at about $1.6 billion, the second highest in the state. Within the low-risk erosion zone, Door County has a total of 11,267 structures, valued at over $3.8 billion. The state's hazard mitigation plan ranks both low- and high-risk erosion zones as "high" risk for potential losses in Door County.

Summary of Improved Structures in Coastal Erosion Zones for Door County

High-Risk Erosion Zone (0.25 from Coastal Area Boundary)		Low-Risk Erosion Zone (0.50 miles from Coastal Area Boundary)	
# Improved Parcels	$ Value of Improvements	# Improved Parcels	$ Value of Improvements
7,836	$1,617,963,800	11,267	$3,894,553,600

Source: State of Wisconsin Hazard Mitigation Plan, 2016.

DROUGHT AND EXTREME HEAT

Extreme Summer Heat

According to the National Weather Service, “extreme summer heat” is the combination of very high temperatures and exceptionally humid conditions. If such conditions persist for an extended period of time, it is called a heat wave. When possible, the National Weather Service warns people and agencies that extreme heat conditions are forecasted:

- Excessive Heat Outlook. A warning is issued when conditions for an excessive heat event may occur in the next three to seven days; provides information to those who need to plan for heat (i.e. emergency management, public health officials, utility companies).
- Excessive Heat Watch. A warning is issued when conditions for an excessive heat event are expected to occur in the next twelve to 48 hours.
- Excessive Heat Warning/Advisory. A warning is issued when an excessive heat event is expected to occur in the next 36 hours.

The National Weather Service issues an outlook, watch, or warning/advisory when the heat index (or how hot it really feels) is expected to exceed 105º F to 110º F for two consecutive days. At a heat index of 105º F or higher, the heat is extreme enough to cause disorders associated with exposure to heat and/or physical activity. Heat index is a function of the actual temperature and the relative humidity. Table 2.5 below shows the danger categories and heat disorders with their corresponding heat index values. Note that caution should be taken when the heat index value approaches 90° F. The table below describes heat index disorders.

Heat Index and Disorders

Danger Category	Heat Disorder	Heat Index Value (how hot it feels)
Extreme Danger	Heatstroke or sunstroke imminent	>130°F
Danger	Sunstroke, heat cramps, or heat exhaustion *likely*; heat stroke possible with prolonged exposure and physical activity.	105°F - 130°F
Extreme Caution	Sunstroke, heat cramps, and heat exhaustion *possible*; heat stroke possible with prolonged exposure and physical activity.	90°F - 105°F
Caution	Fatigue possible with prolonged exposure and physical activity.	89°F - 90°F

Source: NOAA National Weather Service, 2008.

Extreme heat is the number one weather killer nationwide, killing 162 people annually, according to the ten-year average from 2000-2009 from the National Weather Service. There are different stages of heat disorders associated with exposure to heat:

- Heatstroke. An often fatal medical emergency occurring when the body’s responses to heat stress are insufficient to prevent a substantial rise in the body’s core temperature, typically exceeding 105°F; even with rapid cooling and treatment, the average fatality rate is 15%.
- Heat Exhaustion. A less serious medical condition characterized by dizziness, weakness, or fatigue; body temperatures may be normal or slightly-to-moderately elevated; with fluid treatment, prognosis is typically good.
- Heat Syncope. A sudden loss of consciousness, typically associated with people exercising who are not acclimated to warm temperatures; causes little or no harm to the individual.
- Heat Cramps. May occur in people unaccustomed to exercising in the heat.

In addition to affecting people, extreme heat puts significant stress on plants and animals. Extreme heat may reduce crop yields or contribute to crop loss. Similarly, livestock may become overheated, leading to reduced milk production and other problems.

NCEI describes "excessive heat" as a combination of high temperatures (well above normal) and high humidity. An excessive heat event occurs whenever heat index values meet or exceed locally/regionally established excessive heat warning thresholds, on a widespread or localized basis. Fatalities (directly-related) or major impacts to human health occurring during excessive heat warning conditions are reported using this event category.

One excessive heat event was recorded in the NCEI Storm Events database for Door County in 2000. Note that the state's hazard mitigation plan reports that Door County experienced 29 heat wave days and nine heat wave events between 1982 and 2015. A heat wave event is a period of abnormally and uncomfortably hot and unusually humid weather, typically lasting two or more days.

All municipalities in Door County are equally vulnerable to extreme temperatures. Extreme temperatures tend to have the greatest impact on the elderly.

Drought

Due to its multi-dimensional nature, drought is a complex and difficult hazard to define in exact terms, partly because of the ways it differs from other natural hazards:

- The onset and end of a drought are difficult to determine due to slow accumulation and lingering effects after its apparent end.
- The lack of an exact and universally accepted definition adds to the confusion of existence and severity.
- The impact of drought is less obvious and may be spread over a larger geographic area.

Drought is the result of a natural decline in expected precipitation over an extended period of time, and occurs in virtually every climate on the planet, including areas of high and low precipitation. A drought's severity depends on its duration, intensity, geographic extent, and water supply demands for both human use and vegetation. The severity of a drought can be aggravated by other climatic factors, such as prolonged high winds and low relative humidity. The following four definitions are commonly used to describe drought:

- Meteorological drought: degree of dryness, expressed as a departure of actual precipitation from expected average or normal amount, based on monthly, seasonal, or annual time scales
- Hydrological drought: effects of precipitation shortfalls on streamflows, reservoir, lake, and groundwater levels
- Agricultural drought: soil moisture deficiencies relative to water demands of crop life
- Socioeconomic drought (or water management drought): demand for water exceeds the water supply, resulting in a water shortage.

The NCEI Storm Events database shows six drought events occurring between 1999 and 2007; one drought was reported in 1999, two in 2005, and three in 2007.

According to the state hazard mitigation plan, the future incidence of drought is highly unpredictable, and may also be localized, making it difficult to determine probability with any accuracy. NOAA is improving its methodology to accurately forecast drought conditions using a combination of current and historical precipitation, streamflow, ground water, and crop data to perform short-term and long-term forecasts.

Climate Change

Note that "climate change" is not a category within the NCEI Storm Events database.

NOAA defines climate change as a non-random change in climate that is measured over several decades or longer. The change may be due to natural or human-induced causes. The Wisconsin Initiative on Climate Change Impacts (WICCI) has been researching effects of climate change specific to Wisconsin. WICCI is a partnership between the University of Wisconsin, DNR, and other state agencies and institutions. The group was formed in 2007 as a response to a bi-partisan state legislative committee wanting to better understand the potential effects of climate change within the state.

In its preliminary work, WICCI found that Wisconsin's climate has changed in a pattern that is consistent with well-documented global trends. The WICCI analysis was based on daily weather data recorded between 1950 and 2006 at 176 weather stations from throughout the state. The key findings from this analysis are as follows:

- There was a statewide increase in annual average temperature of 1.1°F, with peak warming in the northwest portion of Wisconsin.
- The observed average temperature increase in the state has been highest for winter; statewide winter temperatures have increased 2.5°F since 1950, with 3.5°F to 4.5°F increases in the northwest portion of the state.
- Wisconsin experiences fewer nights below 0°F than in 1950. Specifically, most of the state experiences between two and six fewer nights, while the extreme northwestern portion of the state experiences between 18 and 24 fewer nights below 0°F.
- Statewide, the average growing season lasts 12 days longer than it did in 1950. In other words, the "spring thaw" comes sooner, and the "fall freeze" comes later.
- Wisconsin has experienced a 10% increase in average annual precipitation over the 56-year period from 1950 to 2006. This is an annual average of about three more inches of precipitation than in the 1950s. Noteworthy is the additional precipitation, as much as seven inches, in areas with high population density, such as near Madison (Dane County), Milwaukee (Milwaukee County), Eau Claire (Eau Claire County), and Hudson (Saint Croix County).

According to the state hazard mitigation plan, Door County experienced the following temperature changes between 1950 and 2006:

- 1.0 – 1.5 degree increase in average temperature;
- 1.0 – 1.5 degree increase in average winter temperature; and
- 1.5 – 3.5 inch increase in average annual precipitation.

Historical temperature and precipitation data for Wisconsin have shown that the state has become warmer and wetter since 1950. According to WICCI, between 1950 and 2006, Wisconsin's average annual temperature rose by 1.1 degrees Fahrenheit and average annual precipitation has increased by 3.1 inches. Circulation models predict that this warming trend will continue and increase, with future precipitation also likely to increase. More precipitation is likely to occur in the form of rain and freezing rain during the winter, as well as increasing in both frequency and intensity during the spring and fall. By 2050, temperatures for the state are predicted to warm between 6° and 7° Fahrenheit.

The combination of warmer temperatures, more precipitation, and more intense precipitation will have a critical impact on the quantity and quality of the state's water resources, natural habitats, agriculture, and the social and built environment. The state's coastal regions will face unique challenges in the form of shoreline erosion and recession and threats to coastal wetlands due to lower water levels, with Lake Michigan's average water level predicted to decrease by about a foot by the end of the century.

According to the state's hazard mitigation plan, the future is uncertain with regard to climate change, with varying models predicting a range of outcomes. It is unknown how much the climate will change and at what speed it will change. As further research is performed, better models to predict the effects of climate change will become available.

IDENTIFICATION OF COMMUNITY ASSETS (ASSET INVENTORY)

This section identifies each participating jurisdiction's assets at risk to hazards. Although all assets may be affected by hazards, some assets are more vulnerable because of their physical characteristics or socioeconomic uses. Assets are defined broadly to include anything that is important to the character and function of a community and can be described generally as people, economy, built environment, and natural environment. More specific descriptions are provided below, followed by chart listing county assets by north, central, and south areas of the county.

People

- concentrations of residents and employees
- visiting populations and their likely locations
- locations and concentrations of access and functional needs populations
- demographics of projected population growth
- locations that provide health or social services that are critical to disaster recovery

Economy

- major employers, primary economic sectors (e.g., agriculture), and commercial centers whose losses or inoperability would have severe impacts on the community and its ability to recover from a disaster
- dependencies between economic sectors and businesses and the infrastructure needed to support them

Built Environment

- Existing Structures
    - buildings, which include commercial, industrial, and single and multi-family residential
    - age and construction type of buildings to understand building codes in effect and quality of construction
- Facilities
    - location, construction standards, age, and life expectancy of specific critical infrastructure and facilities in the planning area
    - dependencies between infrastructure systems, critical facilities, and the people they serve

Natural Environment

- most valuable areas that can provide protective functions that reduce the magnitude of hazard events
- critical habitat areas and other environmental features that are important to protect

COMMUNITY ASSETS CHART		
NORTHERN DOOR	**CENTRAL DOOR**	**SOUTHERN DOOR**
People: Concentrations of Residents and Employees		
Villages: ○ Village “downtowns” (Ephraim, Egg Harbor, and Sister Bay) Also in Village of Sister Bay (outside of downtown area): ○ Evangelical Lutheran Good Samaritan Society, C/O Scandia Village, 10560 Applewood Rd ○ Northeast Wisconsin Technical College, 2438 S Bay Shore Dr ○ Northern Door Child Care & Learning Center Inc., 10520 Judith Blazer Dr ○ Sports Complex and Dog Park (2155 and 2124 Autumn Ct) **Towns**: ○ Core Area “downtowns” (Gills Rock, Ellison Bay, Fish Creek, Baileys Harbor, Jacksonport) ○ Gibraltar School (TGB, 3924 and 3926 State Hwy 42) ○ Door County YMCA Inc (TGB, 3866 Gibraltar Rd) **Also see below:** ○ “People: Visiting Populations and Their Likely Locations” ○ “People: locations and concentrations of access and functional needs populations” ○ Manufactured home parks in the “Built Environment: Existing Structures” section ○ Grocery stores listed in the “Economy” section	**City**: ○ Door County Memorial Hospital (3711 State Hwy 42) ○ Boys & Girls Club of Door County Inc. (55 S 3rd Ave) ○ Door Community Child Development Center (1743 Egg Harbor Rd) ○ Anna's House Sturgeon Bay LLC (839 S 18th Ave) ○ Door County YMCA Inc. (1900 Michigan St.) ○ Schools (see all public and private school listed in “locations and concentrations of access and functional needs populations”) ○ Large apartment complexes **Also see below:** ○ “People: Visiting Populations and Their Likely Locations” ○ “People: locations and concentrations of access and functional needs populations” ○ Manufactured home parks in the “Built Environment: Existing Structures” section ○ Grocery stores listed in the “Economy” section	**Village of Forestville**: ○ “downtown” area ○ multi-family apartment building (178 W Park St.) **Towns:** ○ Southern Door School (Gardner, 2073 County Hwy DK) ○ S&S AG Enterprises, LLC (TFV, 7900 Old Elm Rd) ○ Renard’s Cheese (TNS, 2189 County Road DK & TCB, 248 County Road S) **Also see below:** ○ “People: Visiting Populations and Their Likely Locations” ○ “People: locations and concentrations of access and functional needs populations” ○ Manufactured home parks in the “Built Environment: Existing Structures” section ○ Grocery stores listed in the “Economy” section
People: Visiting Populations and Their Likely Locations		
Villages: ○ Village “downtowns” (Egg Harbor, Ephraim, and Sister Bay) ○ Village of Egg Harbor (popular downtown locations): ▪ Donald & Carol Kress Pavilion (7845 Church St) ▪ Harbor Hounds Dog Park (7821 Church St) ▪ Peg Egan Performing Arts Center (7840 Church St) ○ Village of Sister Bay (popular locations outside of downtown area): ▪ Dog Park (2124 Autumn Ct) ▪ Sports Complex (2155 Autumn Ct) **Towns:** ○ Core Area “downtowns” (Gills Rock, Ellison Bay, Fish Creek, Baileys Harbor, Jacksonport) ○ Major campgrounds:	**City:** ○ Two “downtown” areas (3rd Ave and Madison Ave) ○ John Miles County Park (916 N 14th Ave) ○ Sunset Park (747 N 3rd Ave) ○ Otumba Park (225 W Juniper St) **Towns:** ○ Institute and Valmy Core Area ○ Major campgrounds: ▪ Tranquil Timbers, 200+ Sites (TNS, 3668 Grondin Rd) ▪ Potawatomi State Park, 101-199 Sites (TNS, 3740 Park Dr) ▪ Yogi Bears Jellystone Park, 200+ Sites (TNS, 3677 May Rd) ▪ Boy Scouts and Girl Scouts of Washington Island (TWI, 1034 Old West Harbor Rd)	**Village of Forestville** “downtown” area **Towns:** ○ Major campgrounds: ▪ Countryside Motel & RV Sites, 1-25 Sites (TGD, 3120 Stevenson Pier Rd) ▪ Door County KOA, 200+ Sites (TGD, 9245 Lovers Ln) ▪ Stonewood Cottage, 1-25 Sites (TGD, 8213 County Road C) ○ Major attractions (outside of Core Areas): ▪ Robert La Salle County Park (TCB, 408 County Hwy U) ▪ Forestville Dam County Park (TFV, 475 Mill Rd & 7762 County Hwy J) ▪ Sugar Creek County Park (TGD, 2349 County Hwy N)

COMMUNITY ASSETS CHART		
NORTHERN DOOR	**CENTRAL DOOR**	**SOUTHERN DOOR**
▪ Lac Baie Girl Scout Council Inc, 8026 N Maple Rd (TBH) ▪ Baileys Grove Travel Park & Campground, 101-199 Sites (TBH, 2552 County Road F) ▪ Baileys Woods Campground, 51-100 Sites (TBH, 2701 County Road EE) ▪ Beantown Campground, 51-100 Sites (TBH, 8400 County Road F) ▪ Harbour Village Resort, 200+ Sites (TEH, 5840 State Hwy 42) ▪ Monument Point Camping, 51-100 Sites (TEH, 5718 W Monument Point Rd) ▪ Egg Harbor Campground and RV Resort 101-199 Sites, (TEH, 8164 Hwy 42 Hwy) ▪ Frontier Wilderness Campground, 200+ Sites (TEH, 4375 Hillside Rd) ▪ Rustic Timbers, 200+ Sites (TEH, 4906 Court Rd) ▪ Fish Creek Campground & RV, 51-100 Sites (TGB, 3709 County Road F) ▪ Peninsula State Park 200+ Sites (TGB, 9462 Shore Rd) • 10352 Shore Rd, Wecklers • 10130 Shore Rd, large group camping • 10140 Shore Rd, Nicolet ▪ Aqualand Camp Resort, 101-199 Sites (TLG, 2445 Hwy Q) ▪ Dovetail Acre Campground, 51-100 Sites (TLG, 10282 State Road 57) ▪ Hy-Land Court , 51-100 Sites (TLG, 11563 Hwy 42) ▪ Newport State Park, 1-25 Sites (TLG, 475 S County RD Np) ▪ Wagon Trail Campground, 101-199 Sites (TLG, 1190 County Road ZZ) ○ Major attractions (outside of Core Areas): ▪ Cana Island (TBH, 8794 Cana Cove Rd and 8800 E Cana Island Rd) ▪ Door Shakespeare Inc. (TBH, 10038 State Hwy 57) ▪ Birch Creek Music Center Inc (TEH, 3807 and 3821 County Hwy E) ▪ Frank E. Murphy Park (TEH, 7119 Horseshoe Bay Rd) ▪ Chambers Island Lighthouse (TGB, 10971 Base Line Rd) ▪ Northport (TLG, 12632 S Porte Des Morts Dr) ▪ Pebble Beach (TLG, 10511 Pebble Beach Rd) ▪ Sand Bay (TLG, 11154 N Sand Bay Ln) ▪ Portes Des Mortes Park (TLG, 12832 Kenosha Dr) ▪ Garrett Bay (TLG, 1310 Garrett Bay Rd) ▪ Ellison Bluff (TLG, 12050 Ellison Bluff Rd) ▪ Door Bluff (TLG, 12900 Door Bluff Park Rd) ▪ Schoolhouse Beach (TWI, 1860 Schoolhouse Beach Rd) ▪ Jackson Harbor (TWI, 286 Old Camp Rd and N1902 Jackson Harbor Rd)	▪ Rock Island State Park (TWI) ○ Major attractions (outside of Core Areas): ▪ Peninsula State Park (TGB, 9462 W Shore Rd & 9795 Water St) ▪ Haines Bay (TNS, 3713 Town Park Rd) ▪ Clark's Lake beach (TSV, end of Lake Rd) ▪ Whitefish Dunes State Park (TSV, 3275 Clark Lake Rd) ▪ Cave Point County Park (TSV, 5360 Schauer Rd) ▪ George Pinney County Park (TSV, 4879 Bay Shore Dr) ▪ Portage Park (TSB, 2650 Lake Forest Park Rd)	▪ Carmody County Park (TGD, 3586 County Hwy CC) ▪ Wave Pointe Resort (TGD, 3600 CTH CC) ▪ Haines Beach (TNS, 3801 Town Park Rd) ▪ Chaudoirs Dock County Park (TUN, 10865 County Hwy N)

COMMUNITY ASSETS CHART		
NORTHERN DOOR	**CENTRAL DOOR**	**SOUTHERN DOOR**
▪ Ship Island Marina (TWI, 1474 South Shore Dr) ▪ Visitor Center, Washington Island Ferry, and Kap's Marina (TWI, 264 & 273 Lobdell Pt Rd) ▪ Art and Nature Center (TWI, 1799 Main Rd) ▪ Washington Island Farm Museum (TWI, 1675 Jackson Harbor Rd) ▪ Trueblood Performing Arts Center Inc (TWI, 870 Main Rd)		
People: Demographics of Projected Population Growth		
Population Profile, Age 65+: o 2020 population estimate: 2,477 o 2040 population projection: 3,068 o 2020 – 2040 # increase: +591 o Percentage increase: +24%	Population Profile, Age 65+: o 2020 population estimate: 4,565 o 2040 population projection: 5,175 o 2020 – 2040 # increase: +610 o Percentage increase: +13%	Population Profile, Age 65+: o 2020 population estimate: 1,583 o 2040 population projection: 1,992 o 2020 – 2040 # increase: +409 o Percentage increase: +26%
People: locations and concentrations of access and functional needs populations		
Village of Sister Bay: o Evangelical Lutheran Good Samaritan Society, C/O Scandia Village (10560 Applewood Rd) o Bay View Apartments (2255 Mill Rd) **Town**: Gibraltar School (TGB, 3926 State Hwy 42 and 3924 State Hwy 42)	**City:** o Aging and Disability Resource Center (916 N 14TH Ave) o YMCA (1900 Michigan St) o Cardinal Ridge Assisted Living o Anna's House (839 S 18th Ave) o Whispering Pines o Pinecrest Village o Dorchester/Golden Living o Sunshine house o Door County Memorial Hospital (3711 State Hwy 42) o Schools: • NWTC • Sawyer • Sunrise • High school/middle school • Private schools (St. John Bosco and St. Peter's schools) o Door County Child Development Center (1743 Egg Harbor Rd) **Town**: Wisconsin Humane Society (TNS, 3475 Park Dr)	**Towns:** o Adventures Child Care Inc. (TBR, 1645 Tee Off Ln) o Southern Door School, Joint School District No 1 (TGD, 2073 County Hwy DK)
People: locations that provide health or social services that are critical to disaster recovery		
Village of Sister Bay: o Evangelical Lutheran Good Samaritan Society, C/O Scandia Village (10560 Applewood Rd)	**City of Sturgeon Bay:** o Door County Community Foundation (222 N 3rd Ave)	--

COMMUNITY ASSETS CHART

NORTHERN DOOR	CENTRAL DOOR	SOUTHERN DOOR
○ Aurora Medical Group Inc. (2521 and 2525 S Bay Shore Dr) **Town**: North Shore Medical Clinic (TGB, 3711 ST HY 42)	○ Sunshine House (55 W Yew St) ○ Feed and Clothe My People (204 N 14th Ave) ○ Lakeshore Cap Inc. (131 S 3rd Ave) ○ Door County Memorial Hospital (1661 & 1743 Michigan St, & 323 S 18th Ave)	

ECONOMY:

- **Major employers, primary economic sectors (e.g., agriculture), and commercial centers whose losses or inoperability would have severe impacts on the community and its ability to recover from a disaster.**
- **Dependencies between economic sectors and businesses and the infrastructure needed to support them.**

○ There are many small employers in the leisure and hospitality sector located in the Village "downtowns" and Core Areas (Gills Rock, Ellison Bay, Fish Creek, Baileys Harbor, Jacksonport). ○ Total improved value in Northern Door Core Areas: $276,513,000 ▪ Gills Rock: $15,558,100 ▪ Ellison Bay: $49,581,700 ▪ Liberty Grove: $46,153,900 ▪ Fish Creek: $86,778,200 ▪ Baileys Harbor: $58,205,900 ▪ Jacksonport: $20,235,200 ○ Grocery stores: ▪ Bley's (TJP) ▪ Piggly Wiggly (VSB) ▪ Main Street Market (VEH) ▪ Pioneer Store (TLG/Ellison Bay)	**City**: ○ Door County Economic Dev Corp (185 E Walnut St) ○ Destination Door County (1015 Green Bay Rd) ○ Door County Community Foundation (222 N 3rd Ave) ○ Sturgeon Bay Visitor & Conv Bureau (36 S 3rd Ave Units 1 – 3) ○ Industrial Park: The City has many large manufacturing employers located in the industrial park. The total improved value within the Industrial Park is $10,969,400. ○ Grocery stores (EconoFoods, Wal-mart, Pick 'n Save, The Healthy Way)	**Village of Forestville:** ▪ "downtown" ▪ Uni-mart (VFV) **Towns**: ○ Total improved value in Southern Door Core Areas: $25,644,600 ▪ Brussels: $10,913,800 ▪ Gardner: $4,956,400 ▪ Maplewood: $5,199,100 ▪ Sturgeon Bay: $4,575,300 ○ Grocery store: Marchant's Foods, Inc. (TBR)

BUILT ENVIRONMENT: EXISTING STRUCTURES

- **Buildings, which include commercial, industrial, and single and multi-family residential.**
- **Age and construction type of buildings to understand building codes in effect and quality of construction.**

Manufactured Home Parks (2 parks, 22 total units) ○ Hy-Land Mobile Home Park, 11563 State Highway 42, Ellison Bay, Wi 54210, 17 units ○ Robertoy Homes, 5 units (TGB, 8240 State Highway 42)	Manufactured Home Parks (8 parks, 406 total units) City: ○ Cherry Estates, 20 units (2119 Cherry Blvd) ○ Gitche Gumee Resort LLC, 6 units (4306 Gitche Gumee Rd) ○ Thunderhill Estates, 267 units (417 N 14th Pl) ○ Highland Heights Estates, 29 units (1329 W Walnut Dr) ○ Sunrise Shores, 45 units (corner of Hudson & Elm) Towns: ○ Gregory Thiede MHP, 2 units (TEH, 5772 W Carlsville Rd) ○ Quietwoods North, 26 units (TNS, 668 Grondin Rd) ○ Sand Bay Beach Resort, 11 units (TNS, 3798 Sand Bay Point Rd)	Manufactured Home Parks (14 parks, 304 total units): ○ Bay Woods Development, 13 units (3480 CTH CC) ○ Chaudoirs Dock No 2, 55 units (TUN, 10851 & 10859 CTH N) ○ Goetz Resort, 81 units (TGD, 3402 CTH CC) ○ Little Birdie LLC, 15 units (TNS, 3574 Stewart Ln) ○ Rileys Bay Mobile Home Community, 16 units (3541 Rileys Bay Rd) ○ Sunnyvale Estates Adem LCC, 20 units (7625 State Highway 57) ○ Whispering Sands Resort LLC, 22 units (TNS, 3820 Sand Bay Point Rd) ○ White Birch Trailer Park, 24 units (1280 S Bayshore Rd) ○ Harold's Court, 8 units (Bent Road) ○ Misty Hollow Court, 11 units (Route 8) ○ Quiet Woods South Mhp, 10 units (TGD, 9245 Lovers Ln) ○ Weldons Resort, 12 units (TGD, 3540 CTH CC) ○ Pleasant View Tr Park, 5 units (TNS, 6404 CTH C) ○ Willems Trailer Court, 12 units (TGD, 3561 CTH CC)

Built Environment: Infrastructure and Critical Facilities

- **Location, construction standards, age, and life expectancy of specific critical infrastructure and facilities in the planning area.**
- **Dependencies between infrastructure systems, critical facilities, and the people they serve.**

Hospitals and medical facilities		
Village of Sister Bay: ○ Evangelical Lutheran Good Samaritan Society, C/O Scandia Village (10560 Applewood Rd) ○ Aurora Clinic (2521 S Bay Shore Dr) **Town**: North Shore Medical Clinic (TGB, 3711 ST HY 42)	**City**: ○ Door County Medical Center (323 S 18th Ave) ○ Aurora (1910 Alabama St) ○ Bellin (311 N 3rd Ave)	--
Water and wastewater		
Wisconsin DNR Peninsula State Park Wastewater Treatment Facility (services Peninsula Park) **Village of Egg Harbor** Wastewater Treatment Facility (services Village of Egg Harbor), 4548 Ball Park Rd **Village of Ephraim** Wastewater Treatment Facility (Services Village Of Ephraim), 10285 Town Line Dr, Sewage Treatment **Village of Sister Bay:**	**City:** ○ Sturgeon Bay Utilities Wastewater Treatment (services City of Sturgeon Bay and one parcel in the Town of Sturgeon Bay and several parcels in the Town Nasewaupee, but also accepts and treats septic holding tank waste from other areas of the county. ▪ Supplier: Sturgeon Bay Utilities ▪ Source: wells ▪ Storage capacity: ground - 1,350,000 gal.; overhead - 700,000 gal. ▪ System Capacity: 4,968,000 gal/day ▪ Average consumption: 1,600,000 gal/day ▪ Connections (# of meters): 3,965 residential; 450 commercial; and 40; industrial; serving an est. 9,000 people	**Village of Forestville:** ○ sewage treatment facility (429 Gaede Ave) ○ Forestville Wastewater Treatment Facility (services Village of Forestville) **Town**: Maplewood Sanitary District No. 1 (TFV, S1561 ST HY 42 and 7632 County Hwy H) ▪ Services Maplewood (part of Town of Forestville) ▪ Source: wells ▪ Storage capacity: none ▪ System capacity: 136,000 gal./day with one well out of service or 272,000 with both wells running

○ Wastewater Treatment Facility (Sister Bay Water Works, services approximately one-half of the Village of Sister Bay and part of the Town of Liberty Grove) 2124 Autumn Ct. ○ Sister Bay Water Tower (2497 Jungwirth Ct) ▪ Source: wells ▪ Storage capacity: standpipe - 100,000 gal.; tower - 150,000 gal. ▪ System capacity: 1,610,000 gal./day ▪ Average consumption: winter - 130,000 gal./day; summer - 340,000 gal./day ▪ Peak consumption: 498,000 gal./day. *Peak consumption is the highest quantity of water consumed over a given time period, most commonly ▪ Connections (# of meters): Village - 776 residential & 185 commercial; Town - 138 residential & 20 commercial **Towns**: ○ Baileys Harbor Wastewater Treatment Facility, 2605 Summit Rd (services Baileys Harbor "downtown") ○ Fish Creek Sanitary District 1 Wastewater Treatment Facility, (services Fish Creek in Town of Gibraltar, 3815 County Hwy F) ○ Liberty Grove Sanitary District (2276 Hill RD (lift station?) ○ Sevastopol Sanitary District No. 1 Wastewater Treatment Facility, (TSV, 4900 HY 57, services Institute and Valmy)	▪ plus 8 lift stations ○ Water towers (5, plus 2 tanks on top of big hill): ▪ 236 S Duluth Ave ▪ 210 W Redwood St (and ATC Substation) ▪ 1138 S Neenah Ave ▪ 1003 S Duluth Ave ▪ 191 N 9th Ave (Big Hill) **Town**: Sevastopol Sanitary Dist No 1 (TSV, 4900 State Hwy 57)	▪ Average consumption: 6,179 gal./day ▪ Peak consumption: 38,000 gal./day ▪ Connections (# of meters): 44 residential & 6 commercial, serving an estimated 122 people
Police and fire stations; emergency operations centers		
Villages: ○ Egg Harbor Fire Department (4562 Harbor School Rd) ○ Ephraim Fire Department (10011 Norway) ○ Village of Sister Bay/Town of Liberty Grove fire stations (1487 State Hwy 42 and 2258 Mill Rd) **Towns**: ○ Baileys Harbor Volunteer Fire Department (2404 Park St) ○ Egg Harbor Fire Department - Station 2 (5242 County I) ○ Town of Gibraltar fire station: (3478 & 3496 County Hwy F) ○ Jacksonport Fire Department (6622 Memorial Dr) ○ Washington Island – Door County Emergency Center (1309 Range Line Rd)	**City**: ○ Door County Justice Center, 1201 S Duluth Ave ○ Door County Government Center, 421 Nebraska St. ○ West Fire station, 656 S. Oxford Ave ○ East Fire Station and Police Department, 421 Michigan St **Town:** Coast Guard Station (TSB, 2501 Canal Rd)	**Village of Forestville**: Southern Door Fire Dept Inc (E 110 E Main St) **Towns**: ○ Brussels-Union-Gardner Fire Dept Inc. (TBR, 1358 CTH DK) ○ Brussels-Union- Gardner Fire Dept Inc (TGD, 3116 N Stevenson Pier Rd and 808 CTH C) ○ Southern Door Fire Dept Inc (TNS, 6860 County Hwy M)

<table>
<tr><td colspan="3">Power utilities. Four transmission lines run through Southern Door to the City. Only one transmission line serves all of northern Door County (north of the Dunn station). Major transmission lines within Door County include 138 kilovolt lines. Smaller electric transmission lines (69 kilovolt) also traverse throughout the county.</td></tr>
<tr>
<td>One transmission line serves all of northern Door County (north of the Dunn station).
Wisconsin Public Service Corp
TEH, 7906 Heritage Lake Rd
TLG, 10263 State Hwy 57 and 11569 Old Stage Rd
The Washington Island Electric Cooperative Inc., a private electric service utility established in 1945, serves approximately 700 year-round residents and 1,300 seasonal residents on Washington Island. (1157 Main Rd and 201 Green Bay Rd)</td>
<td>City:
Sturgeon Bay Utilities (SBU, 230 E Vine St). Maintains an electric distribution system that services over 8,300 customers in the City of Sturgeon Bay and the Towns of Clay Banks, Nasewaupee, Sevastopol, and Sturgeon Bay. Utility staff members are responsible for maintaining four substations with current capacity of over 98 megawatts and over 281 miles of overhead and underground transmission lines. Over 3,300 transformers regulate the voltage measured by 9,400 meters used by its customers.
Wisconsin Public Service Corp stations
1479 S Neenah Ave (gas)
44 N 14th Ave (offices/yard)
1840 Michigan St (gas)
American Transmission Co., LLC (electric)
1801 Barge Rd
214 W Redwood St
37 W Redwood St
Sturgeon Bay Utilities (electric)
210 W Redwood
8 W Yew
113 S 1st Ave
2210 Michigan St
Town: Wisconsin Public Service Corp station (TSV, 5655 W Dunn Rd)</td>
<td>Four transmission lines run through Southern Door to the City. Only one transmission line serves all of northern Door County (north of the Dunn station).
Sturgeon Bay Utilities (SBU, 230 E Vine St). Maintains an electric distribution system that services the Towns of Clay Banks.
Wisconsin Public Service Corp stations
TNS, 2030 School Ln
TFV, 6787 County Hwy J</td>
</tr>
<tr><td colspan="3">Transportation (roads, railways, waterways)</td></tr>
<tr>
<td>Towns:
TLG:
Door County Highway Shop (10363 State Hwy 57)
Washington Island Ferry Line Inc (213, 220, 12743, and 12745 STH 42; and 12719 N Porte Des Morts Dr)
Ferry (12689 & 95, STH 42)
TWI:
Door County Highway Shop (1291 Airport Rd)
Washington Island Ferry Line Inc, 262 Lobdell Point Rd</td>
<td>City:
Sturgeon Bay Ship Canal/Port of Sturgeon Bay
Fincantieri Bay Shipbuilding (FBS), Shipyard (605 N 3rd Ave)
Door County Highway Shop (1001 S Duluth Ave)</td>
<td>Town: Door County Highway Shop (TBR, 1729 County Hwy DK)</td>
</tr>
</table>

<table>
<tr><th colspan="3">Communication systems/centers</th></tr>
<tr>
<td>Village of Egg Harbor: GTE North, Inc. (4600 CO HY E)

Village of Sister Bay: GTE North, Inc. (10557 Applewood Rd)

Towns:
TBH: General Telephone Company (8082 Guy St)
TEH:
○ Door County towers (4695 Sunny Slope Rd)
○ 2102 LLC, 7148 Ida Red Rd Unit 1603
○ 4293 Harbor School Rd
○ 7120 Horseshoe Bay Rd
TGB:
○ General Telephone Company (8574 State Hwy 42)
○ Chambers Island Parking and Tower (10997 Island Dr E)
TJP:
○ Station (3381 CTH V)
○ General Telephone Company (3381 County Hwy V)
TLG:
○ Tower, Wisconsin Educational Communications Board (11670 Old Stage Ct)
○ Tower Development LLC (11666 Old Stage Ct)
○ General Telephone Company (11680 Old Stage Ct)
TWI: General Telephone Company (1108 Main Rd)</td>
<td>City:
○ Door County Broadcasting Co Inc (800 S 15th Ave)
○ emergency transmission towers owned by Door County – one by Justice Center and one by the ADRC

Towns:
○ Communications tower (TSB, 2054 South Shiloh Rd)
○ Door County Broadcasting Co Inc (TSV, 4891 County Hwy HH)
○ US Cellular (TSV, 4827 County Hwy HH)</td>
<td>Village of Forestville:
○ Communications building (129 N Grand Ave)
○ Tower (429 Gaede Ave)

Towns: Forestville Telephone Company
○ Brussels (1271 and 9145 County Hwy J)
○ Forestville (S1549 State Hwy 42)
○ Gardner:
▪ 2249 Brussels Rd
▪ 3108 and 9576, County Hwy CC
▪ 8900 Lime Kiln Rd
○ Nasewaupee (3327 Park Dr)</td>
</tr>
<tr><th colspan="3">Schools</th></tr>
<tr>
<td>Towns:
○ Gibraltar School (TGB, 3924 & 3926 State Hwy 42)
○ Washington Island School District (TWI, 888 Main Rd)</td>
<td>City:
○ Sturgeon Bay School District:
▪ High School, 1230 Michigan St
▪ TJ Walker Middle School, 19 N 14th Ave
▪ Sunrise Elementary, 1414 Rhode Island St
▪ Sawyer Elementary, 60 Willow Dr
○ St. John Bosco, 730 W Maple St
○ St. Peter’s Lutheran, 108 W Maple St
○ NWTC (229 N 14th Ave)

Town: Sevastopol Consolidated School (TSV, 4550 State Hwy 57 and 4498 E Dunn Rd)</td>
<td>Town: Southern Door School, Joint School District No 1, 2073 County Hwy Dk (TGD)</td>
</tr>
</table>

<table>
<tr><th colspan="3">Energy pipelines and storage</th></tr>
<tr>
<td>Villages:
Village of Sister Bay:
Northern Propane Gas Co (10628 N Highland Rd)
Lakes Gas Company (Lamperts, 2613 S Bay Shore Dr)
Village of Ephraim: gas propane distributor (6276 ST HY 42)
Town: Lakes Gas Company (TEH, 6276 State Hwy 42)</td>
<td>City:
Lakes Gas Co (235 Nautical Dr)
Ferrill Gas Co (228 S. Neenah Ave)</td>
<td>Towns:
Propane storage
Door County Cooperative Propane (TBR, 7460 WI-42 #57)
Lakes Gas Company (TNS, 2136 School Ln)</td>
</tr>
<tr><th colspan="3">Airports/landing strip</th></tr>
<tr>
<td>Towns/Village:
Ephraim Gibraltar Airport (TGB, 9665 Maple Grove Rd)
Washington Island Airport (TWI, 1535 and 1693 Airport Rd)</td>
<td>Town: Door County Cherryland Airport (TNS – 3327, 3418, 3538, and 3640 Park Dr.)</td>
<td>Town: Airport accessory structure (TFV, 1767 CO HY O)</td>
</tr>
<tr><th colspan="3">Administrative & Community Buildings</th></tr>
<tr>
<td>Villages:
Village of Egg Harbor:
Village hall/Bertschinger Community Center (7860 State Hwy 42)
Donald & Carol Kress Pavilion (7845 Church Street)
Egg Harbor Public Works (4548 Ball Park Road)
Village of Ephraim:
Village hall and administrative buildings (9996 Water St. and 10005 N Norway St.)
Public Works (10285 Townline Rd.)
Village of Sister Bay:
Village hall (10647 Bluffside Ln)
Public Works (2313 Mill Rd)
Towns:
TBH: Town hall (2392 CO HY F)
TEH: Town Hall (5242 CTH I)
TGB: Town hall, library, and administrative buildings
4097 Main St
3926 STH 42
4176 Maple St
10169 Shore Rd
TJP: Town hall (3365 CO HY V)
TLG:
Town hall (11161 Old Stage Rd)</td>
<td>City:
City Hall (421 Michigan Street)
Public works (835 N 14TH Ave)
Towns:
Town halls:
TNP: 3388 PARK DR
TSV: 4528, HY 57</td>
<td>Village of Forestville: Village Hall (123 S Forestville Ave)
Towns:
Town halls:
TCB: 6098 Co Hy OO
TFV: 7701 County Hwy H
TGD: 2344 Co Hy C
TUN: 10826 Stage Rd</td>
</tr>
</table>

▪ Post Office (12055 Garrett Bay Rd) ○ TWI ▪ 910 Main Rd, Town Hall ▪ 870 Main Rd, Community Building		
NATURAL ENVIRONMENT • **Most valuable areas that can provide protective functions that reduce the magnitude of hazard events.** • **Critical habitat areas and other environmental features that are important to protect.**		
○ 22,905 preserved acres ○ 19,301 ac. zoned wetland ○ 8,323 ac. flood zone ○ 96 impervious surface acres in flood zone (not including WI) ▪ 25 building acres, total improved value of $162,046,200 ▪ 28 road acres ▪ 20 driveway acres	○ 6,735 preserved acres ○ Wetland area: 17,797 acres ○ Flood zone area: 4,189 acres ○ Impervious surface acres in flood zone: 157 acres ▪ 32 building acres, total improved value of $103,361,400 ▪ 36 road acres ▪ 21 ac driveway acres	○ 3,790 preserved acres ○ Wetlands 19,721 ac. ○ Flood zone 4,543 ac. ○ 46 impervious acres in flood zone ▪ 9 building acres, total improved value of $33,270,000 ▪ 25 road acres ▪ 8 driveway acres

Planning and Regulatory

Plan/Program	Door County	City of Sturgeon Bay	Village of Egg Harbor	Village of Ephraim	Village of Sister Bay
Comprehensive Plan	2015 – 2035; some discussion on the impacts of climate change, but no strategy.	2020 – 2040. Recommended Action: Complete a climate event risk assessment in Sturgeon Bay, analyzing areas of vulnerability, identifying hazard mitigation steps, and prioritize an action plan to be ready for potential weather events, including floods.	2020 – 2040	2009 – 2029	2023
Capital Improvements Plan	2019 - 2023	Yes – 2020.	Yes	10 year capital projects/liabilities completed in 2020	Yes
Economic Development Plan	2005, does not address hazards	Yes – as element of comprehensive plan.	No	Part of comprehensive plan	Yes
Local Emergency Operations Plan	Emergency Response Plan	Under County's plan, updated in 2021.	Yes	In process	Yes, 2013?
Continuity of Operations Plan	Emergency Services and Public Health	Yes – adopted in 2016.	No	No	No
Transportation Plan	Yes, does not address hazards	Yes – as element of comprehensive plan.	No	Part of comprehensive plan	No
Stormwater Management Plan	Airport only	Yes – adopted in 2005.	No	Yes, erosion control ordinance	No; CUPAC study addresses some of this
Community Wildfire Protection Plan	No	No	No	No	No
Other special plans	DDC Crisis Management and Business Continuity Plan, Nov. 2020. Primarily addresses post-hazard communications.	Port Security Plan – 2006	Comprehensive Outdoor Recreation Plan - 2025	Green Tier member	No
Building Code	No	Yes – current code adopted by state.	WI UDC	WI UDC	WI UDC
Building Code Effectiveness Grading Schedule (BCEGS) Score	No	No	No	No	No
Fire department ISO rating	None	2	7	6	4/5: 4 – hydrants & 5 – 1,000' beyond hydrants
Site plan review requirements	None	Yes	Yes	Yes, with all building permits	Yes
Zoning ordinance	Yes; comprehensive and shoreland Protects wetlands in regulated areas	Yes – includes wellhead protection standards	Yes	Yes	Yes
Subdivision ordinance	Yes, county-wide; requires stormwater runoff plans for major subdivisions	Yes – includes land suitability, cul-de-sac length, water main looping and other mitigation standards.	Yes	Yes	Yes
Floodplain ordinance	Yes, county-wide	Yes – limits and/or protects development in floodplains	Yes	Yes	No
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	No ordinance, but storm water plans required for many projects	Yes – stormwater management ordinance requires new development to reduce runoff to guard against downstream flooding.	No	Yes	Yes; bluff protection
Flood insurance rate maps	Effective in conjunction with floodplain ordinance	Yes – maps are basis for floodplain ordinance.	Yes	Yes	Yes; part of Village
Acquisition of land for open space and public recreation uses	Yes, 2021 – 2025 Plan	Yes – part of subdivision ordinance	No	Yes	Yes
Other Programs/Comments	Green Tier Program	Shoreland Wetland Zoning Code and Property Maintenance Code prevent development in hazardous wetland conditions and prevent buildings from becoming hazardous from deterioration/neglect, respectively. The codes currently do not have requirements relating to development on steep or unstable slopes. There are no setbacks from wetlands or floodplains.	Public tree removal	None	None

Administrative and Technical

Position/Technical Ability	Door County	City of Sturgeon Bay	Village of Egg Harbor	Village of Ephraim	Village of Sister Bay
Planning Commission	Yes – mostly advisory, no special experience in mitigation planning	Yes – mostly advisory, no special experience in mitigation planning	Yes	Yes	Yes
Mitigation Planning Committee	Public Safety Committee	No	No	No	No
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Parks, tree-trimming	Yes – annual maintenance done by Public Works Department and by Sturgeon Bay Utilities. Generally responsive to potential risks/problems depending on time of year/available human power.	Yes	Yes – tree-trimming and flushing storm sewers done annually	Yes
Mutual aid agreements	Emergency Response Plan	Yes – all of Door and Kewaunee Counties included. July 2014 MABAS division #154 (statewide mutual aid)	Yes	Yes, through fire department (MABAS)	Yes
Chief Building Official	No	Yes, full-time, contracted Yes, no, yes	Part-time	Yes, full-time administrator	Yes, part-time
Floodplain Administrator	Yes, staffing is adequate; staff is not trained on hazard mitigation; coordination between DNR and County staff is effective	Yes, full-time Yes, no, yes	Full-time	Yes, full-time	No
Emergency Manager	Yes, part-time	No; good coordination with county	Full-time	Yes, fire chief/maintenance worker	No
Community Planner	Full-time; coordinates plans between municipalities	Yes, full-time	No	Yes, full-time	Yes, full-time
Civil Engineer	No	Yes, full-time	No	No	No
GIS Coordinator	Yes; position does some coordinating between municipalities	Yes, full-time	No	No	No
Other	--	All City staff is trained in National Incident Management System and Incident Command System 100 & 200	None	None	None
Warning systems/services (Reverse 911, outdoor warning signals)	911 & Code Red	Yes; county system	Yes; county system	Yes; county system	Yes; county system
Hazard data and information	LEPC	Yes; EPCRA reporting and Fire Department inspection records	Yes; limited data	Yes; county system	Yes
Grant writing	Planner can and does write grants	Yes; various grant programs used for emergency equipment and plan creation	Yes; limited	Yes, general municipal grants but not in relation to hazards	Yes
Hazus analysis	No	No	No	No	Yes
Can these capabilities be expanded and improved to reduce risk?	--	Information sharing among various City committees and departments, as well as outside agencies, could be improved. Let all staff/committees know what info/capabilities are available.	--	--	--

Financial (has the funding been used in the past and could the resource be used to fund future mitigation actions?)

Program	Door County	City of Sturgeon Bay	Village of Egg Harbor	Village of Ephraim	Village of Forestville	Village of Sister Bay
Capital improvements project funding	Possibly for government buildings	Yes – stormwater/flooding projects and fire/emergency response equipment Yes	Yes; capital needs. This source could be re-directed to mitigation.	Yes, for roads, docks, maintenance facilities. Has not been used for hazards in the past.	No	Yes
Authority to levy taxes for specific purposes	Most likely not	No/Yes	No	Yes, sanitary sewer	Yes	Yes
Fees for water, sewer, gas, or electric services	No	No/No	Yes, sanitary sewer fees	Yes, sanitary sewer	Yes	Yes
Impact fees for new development	No	No/Yes	No	No	Yes	Yes
Storm water utility fee	NA	No/Yes	No	No, fees charged	No	No
Incur debt through general obligation bonds and/or special tax bonds	Yes, not recently, possibly	No/Yes	Yes	Yes	No	Yes
Incur debt through private activities	No	N/A	Yes	Yes	No	Yes
Community Development Block Grant	Yes; housing down payment and repair	No/Yes	Yes	Yes	No	?
Other federal funding programs	Yes	Yes – Port Security Plan & special rescue equipment Yes	Yes Beach/stormwater improvements, marina repairs	Yes, clean water fund	No	Yes
State funding programs	Yes	Yes – special rescue equipment Yes	Yes, marina repairs	Yes	Yes	Yes
Other	None	Yes – private grant funds (Raibrook Foundation) used for equipment	None	None	Yes	None

Education and Outreach

Program/Organization	Door County	City of Sturgeon Bay	Village of Egg Harbor	Village of Ephraim	Village of Sister Bay
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	United Way? Land Trust? Nature Conservancy? Homeowner's associations?	Ham radio operators provide communications during disaster. Also Civil Air Patrol and U.S. Coast Guard Auxiliary relate to resilience and mitigation. Yes	Yes	No	Sister Bay & Liberty Grove fire fighter's association Northern Door First Responders Association
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Human Services: tracks and investigates diseases, educates families regarding emergency preparedness, designates cooling shelters; issues press releases and public info re: dangerous weather, plans to develop a mass fatality plan.	SBFD has ongoing fire safety, household preparedness, and weather emergency programs that are provided to businesses, schools, etc. Yes	Yes	Yes, through fire dept.	Yes, open house at fire station?
Natural disaster or safety related school programs	Police officer in every school daily	SBFD prepares and has education for local schools disaster plans		Yes, through fire dept.	
StormReady certification	No	No	No	No	?
Firewise Communities certification	No	No	No	No	No
Public-private partnership initiatives addressing disaster-related issues	No	No	No	No	No
Other	None	Funding sources need to be known to staff and the committees that are involved in hazard mitigation. Perhaps a clearinghouse of grant sources and programs could be established. The financial impacts that a disaster can impose on the community should be made available and impressed on communities so that all hazard mitigation becomes a priority.	None	None	None

APPENDIX C: NON-NATURAL HAZARD TYPES, DESCRIPTIONS, AND MITIGATION STRATEGIES FROM 2016 PLAN

NON-NATURAL HAZARD PROFILES

The non-natural hazards described in this section are as follows:

- communicable diseases
- private water supply contamination
- hazardous materials – roadway
- hazardous materials – waterway
- loss of electrical system
- transportation – roadway accidents
- structural fire
- loss of sewer system
- nuclear power plant

The data provided below regarding communicable diseases comes from the Center for Disease Control and Prevention. The roadway accident information comes from the Wisconsin Department of Transportation. The private water supply contamination, hazardous materials on roadways, and hazardous materials on waterways come from the DNR's Remediation and Redevelopment Program, which oversees the investigation and cleanup of environmental contamination and the redevelopment of contaminated properties. The Bureau for Remediation and Redevelopment Tracking System (BRRTS) is the DNR's on-line database that provides information about contaminated properties and other activities related to the investigation and cleanup of contaminated soil or groundwater in Wisconsin for both state and federal cleanup programs. The database includes (but is not limited to) the following contamination data:

- investigations and cleanups of contaminated soil and/or groundwater
- spills
- Superfund sites
- DNR funding assistance

The BRRTS divides the data into groups of activities, as listed below:

- Abandoned container. An abandoned container with potentially hazardous contents has been inspected and recovered. No known discharge to the environment has occurred. If the container discharged a hazardous substance, a "Spills" activity is created at this location (see "Spills" below).
- Leaking Underground Storage Tank (LUST). A LUST site has soil and/or groundwater contaminated with petroleum, which includes toxic and cancer causing substances. However, given time, petroleum contamination naturally breaks down in the environment (biodegradation). Some LUST sites may emit potentially explosive vapors.
- Environmental Repair Program (ERP). ERP sites are sites other than LUSTs that have contaminated soil and/or groundwater. Examples include industrial spills (or dumping) that need long term investigation, buried containers of hazardous substances, and closed landfills that have caused contamination. The ERP module includes petroleum contamination from above-ground (but not from underground) storage tanks.
- Spills. A discharge of a hazardous substance that may adversely impact, or threaten to impact, public health, welfare, or the environment. Spills are usually cleaned up quickly. A spill is reportable to the DNR if there is an impact to human health; to the environment; there is a fire, explosion or safety hazard; or the spill has been cleaned up immediately. Spills more than the quantities listed below must be reported to the DNR:
    - Petroleum compounds

        petroleum product spilled and completely contained on an impervious surface

less than 1 gallon of gasoline or light grade petroleum product spilled onto a pervious surface or which runs off an impervious surface
less than 5 gallons of medium or heavy grade petroleum products spilled onto a pervious surface or which runs off an impervious surface

- Agrichemical compounds

less than 250 pounds dry fertilizer
less than 25 gallons of a liquid fertilizer
pesticides that would cover less than 1 acre of land if applied according to label instructions

- General Property Information. This consists of records of various milestones related to liability exemptions, liability clarifications, and cleanup agreements that have been approved by the DNR to clarify the legal status of a property.
- Voluntary Party Liability Exemption (VPLE). VPLEs are an elective process in which a property owner conducts an environmental investigation and cleanup of an entire property and then receives limits on future liability for that contamination under s. 292.15, Wisconsin Statutes. An individual, business, or unit of government can receive the liability exemption after a completed cleanup is approved.
- No Action Required. There was, or may have been, a discharge to the environment and, based on the known information, DNR has determined that the responsible party does not need to undertake an investigation or cleanup in response to that discharge.

NUCLEAR POWER PLANT (RADIOLOGICAL RELEASE)

The Planning Team assigned nuclear power plant a total of three points out of a possible nine points for level of risk.

Note: the information below is condensed from a Door County Environmental Council newsletter, sourced from Star Tribune, Power Engineering, Associated Press.

The Nuclear Regulatory Commission defines two emergency planning zones around nuclear power plants: a plume exposure pathway zone with a radius of 10 miles, concerned primarily with exposure to, and inhalation of, airborne radioactive contamination, and an ingestion pathway zone of about 50 miles, concerned primarily with ingestion of food and liquid contaminated by radioactivity.

The Point Beach nuclear power plant is located in Two Rivers, approximately 30 miles from Door County's southern border. This plant provides approximately one-sixth of the total electric power generated for Wisconsin. The Kewaunee Nuclear Power Station, now closed, is located in Kewaunee County on the shore of Lake Michigan, 15 miles from Door County's southern border. The plant ceased operation on May 7th, 2013. As of 2015, Dominion Resources, the current owner, was seeking a waiver of this requirement, contending that the rule is outdated and overly conservative. The Nuclear Regulatory Commission's estimate of the risk each year of an earthquake intense enough to cause core damage to the reactor at Kewaunee was 1 in 83,333, according to a study they published in 2010.

HAZARDOUS MATERIALS INCIDENT, INCLUDING FIXED FACILITIES AND TRANSPORTATION

WATER SUPPLY CONTAMINATION – PRIVATE

The Planning Team assigned private water supply contamination a total of eight points out of a possible nine points for level of risk.

Many of the soils in Door County are very shallow, especially in the northern two-thirds of the county. Across most of the county, soils are less than five feet in depth to bedrock; 22% of the soil is less than 18 inches in depth and another 17% is between 18 to 36 inches in depth. The soils in the northern two-thirds of the county are rough and/or shallow, with much of the land cover remaining in woodland or wetland The soils in the southern one-third of the county are deeper, smoother, and predominantly farmed. The largest acreage of the county's wetlands are also found in this region.

Since the county's groundwater is recharged from water that infiltrates through a land surface consisting of thin soils and bedrock formations, Door County has one of the highest risks of surface water pollution to groundwater of any county in Wisconsin. The dolostone bedrock contains many karst features that provide for large water-holding capacity and lateral flow, but also allow water and accompanying contaminants to quickly and directly enter the dolostone aquifer.

As development in an area increases, so does the impervious surface area, such as roofs, driveways, and parking lots. This affects the amount and quality of water that infiltrates to the groundwater due to the changes to vegetative cover, slope, soil composition, and soil depth. Groundwater may be contaminated by construction and agricultural runoff events, which can lead to contamination of private wells, fish kills, and an influx of nutrients into surface waters, causing algal blooms. Additionally, leaking private septic system tanks, usually made out of steel, or other malfunctioning portions of private septic systems, are primary contributors of bacteria such as fecal coliform and E. coli to groundwater.

Figure 2.2 is a groundwater contamination susceptibility map, created by the DNR in partnership with the United States Geological Survey, University of Wisconsin-Extension, and Wisconsin Geological and Natural History Survey. Five physical resource characteristics were identified as important in determining how easily a contaminant can be carried through overlying materials to the groundwater. These characteristics are depth to bedrock, type of bedrock, soil characteristics, depth to water table, and characteristics of surficial deposits (glacial deposits lying between bedrock and soil).

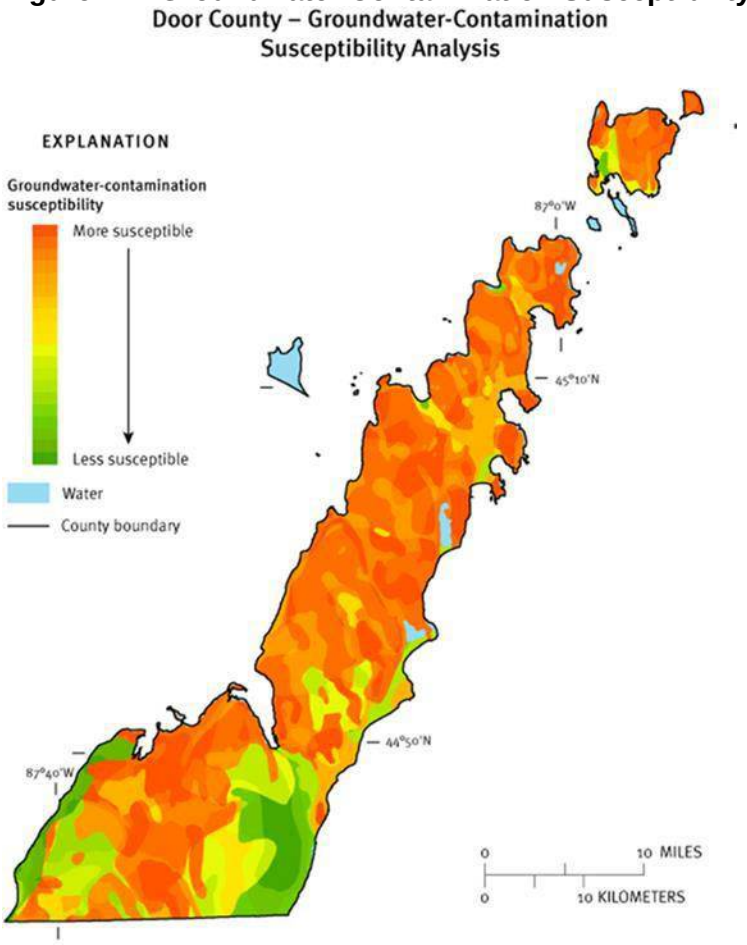
Municipal wells serve approximately one-third of the county's households, while private wells serve approximately two-thirds of the county's households. Only the City of Sturgeon Bay, the Villages of Forestville and Sister Bay, and Maplewood (Town of Forestville) have municipal water. The Village of Sister Bay also serves some households located in the Town of Liberty Grove. The City of Sturgeon Bay and the Villages of Forestville and Sister Bay have mapped their "zones of contribution," the surface area on the land that contributes rain and snowfall to the groundwater for a particular well site. Subsequent to mapping their zones of contributions, the City of Sturgeon Bay, Town of Liberty Grove, and the Village of Sister Bay have adopted wellhead protection ordinances.

Due to Door County's high risk for groundwater contamination, the county has requirements above and beyond the typical state requirements for well-drilling in place, such as additional casing requirements. The well casing is a steel or plastic pipe that lines the well, keeping it from caving in and protecting contamination of the ground water by surface water. In 1971, based on the findings of a study conducted by the Wisconsin Geological Survey of the county's groundwater, the county set casing depths for two different "zones," with minimum requirements of 100 feet and 170 feet depending upon which zone the well was located within. (State-wide, wells constructed prior to 1957 were required to have a uniform minimum

casing of 40 feet; between 1957 and 1971, a uniform minimum casing of 100 feet was required. Currently, state-wide requirements vary depending on site conditions.) Since 2006, the transition areas between those zones are now required to have a minimum of 140 feet of casing. In some situations, the DNR grants variances for construction and/or usage of a well with less than the minimum required casing amounts. The DNR may also recommend more casing based on known contamination in an area.

While municipal wells are routinely tested for contaminants, proper monitoring of contaminants in private wells often does not occur. Known problems for private wells are primarily bacterial contamination and nitrates. Copper and lead can also be present in groundwater, but usually come from plumbing/piping and sometimes from pesticides or herbicides. Lead can also be present in groundwater because of the county's past agricultural practice of using lead arsenic for controlling diseases in orchards.

Figure 2.2: Groundwater Contamination Susceptibility Analysis, Door County



This groundwater-contamination susceptibility map is a composite of five resource characteristic maps, each of which was derived from generalized statewide information at small scales, and cannot be used for any site-specific purposes.

Map source: Schmidt, R.R., 1987, Groundwater contamination susceptibility map and evaluation: Wisconsin Department of Natural Resources, Wisconsin's Groundwater Management Plan Report 5, PUBL-WR-177-87, 27 p.

Figure created for the "Protecting Wisconsin's Groundwater Through Comprehensive Planning" web site, 2007, *http://wi.water.usgs.gov/gwcomp/*

Contaminants may enter the groundwater through spills and leaking underground tanks. Water supply contamination from such occurrences has been reported to the DNR 14 times between 1984 and 2009, as listed below by type:

- 2 ERP – open
- 1 LUST – open
- 1 historical Spill
- 5 closed LUST
- 5 closed Spills

The type of substances causing the contamination and number of events reported are as follows:

- petroleum: 8
- volatile organic compounds: 2
- agriculture chemicals: 2
- food: 1
- manure: 1

Note that the one manure event listed in the database occurred in 2005. Not included in the database is a manure event that occurred in 2014 when manure was spread too close to a sinkhole and ended up in the drinking water supply of nearby homes in the Town of Jacksonport. Sixteen people became ill and one person was hospitalized, according to the Door County Department of Public Health.

HAZARDOUS MATERIALS – ROADWAY

The Planning Team assigned hazardous material spills along or near a roadway a total ranking of six points out of a possible nine points.

Hazardous material spills along or near a roadway in Door County have been reported to the DNR 12 times between 1996 and 2014. The types of substances and number of events reported are listed below:

- petroleum: 8
- agriculture chemicals: 2
- sewage: 1
- anti-freeze: 1
- mineral oil: 1
- manure: 1

HAZARDOUS MATERIALS – WATERWAY

The Planning Team assigned hazardous material spills in a waterway a total of five points out of a possible nine points.

Hazardous material spills resulting in surface water contamination in Door County have been reported to the DNR 193 times between 1971 and 2015. The status of all events are either "closed spill," "historic spill," or "closed ERP." The types of substances and number of events reported are listed below:

- petroleum: 134
- unknown or historical spill with no substance listed: 45
- sewage: 4
- other: 4
- mineral oil: 3
- industrial chemical: 2
- volatile organic compound: 1
- animal product: 1
- food: 1
- industrial chemical: 1
- anti-freeze - 1
- manure - 1

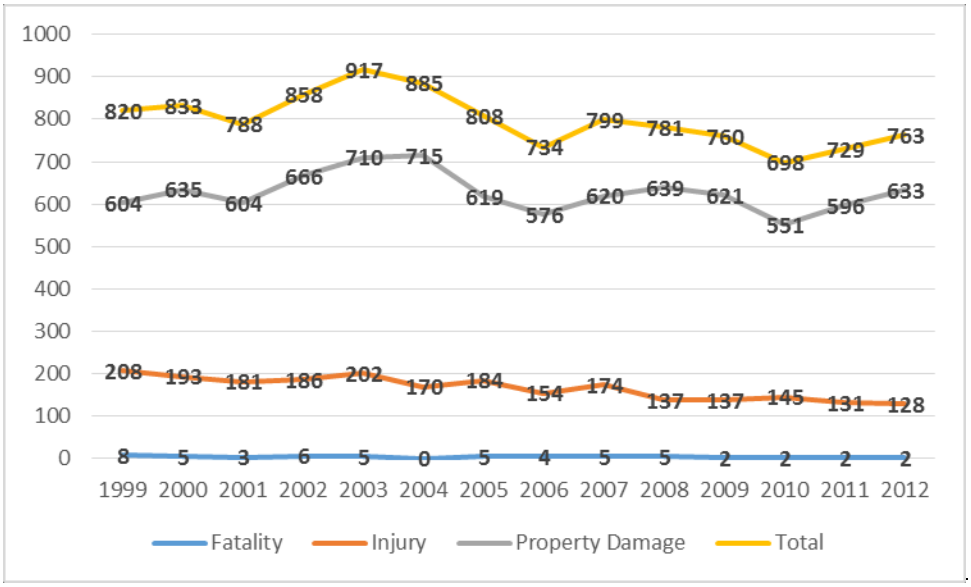
Out of these 193 events, 163 (84%) took place in the Sturgeon Bay area, primarily taking place at the ship building/repair businesses.

TRANSPORTATION – ROADWAY ACCIDENTS

Vehicle crash reports are filed with WisDOT by county and city police departments, providing the time, location, type, and severity of the crash. The number, location, and severity of accidents often indicate problems with road and street alignments, construction, or the geometric design of the street. A variety of measures, including alterations in the street geometry, enlargement of the intersection turning radii, placement of more prominent signs, relocation of access drives, and speed changes, are often used to

alleviate problem areas. Detailed crash information for Door County can be found on-line from WisDOT. Figure 2.3 below shows the most recent data available for number and severity of vehicle crashes in Door County between 1999 and 2012.

Figure 2.3: Number and Severity of Crashes, Door County, 1999 - 2012



Source: http://www.dot.wisconsin.gov/safety/motorist/crashfacts/.

DISRUPTION OF LIFELINES – ELECTRIC, FUEL, WATER, WASTEWATER

LOSS OF ELECTRICAL SYSTEM

According to a federal report issued by the Executive Office of the President, "Economic Benefits of Increasing Electric Grid Resilience to Weather Outages," severe weather is the leading cause of power outages in the United States. During a power outage, the normal operation of homes, businesses, public buildings and other critical community facilities may be interrupted. The costs of outages take various forms, including lost output and wages, spoiled inventory, delayed production, inconvenience, and damage to the electric grid. Grid resilience is increasingly important as climate change increases the frequency and intensity of severe weather. Scientific research predicts more severe hurricanes, winter storms, heat waves, floods and other extreme weather events induced by climate change. Continued investment in grid modernization and resilience will mitigate these costs over time, saving the economy billions of dollars and reducing the hardship experienced when extreme weather strikes.

In addition to the economic costs of power outages, the loss of home heating and cooling systems may lead to heat exhaustion and hypothermia. Note that there are no recorded deaths or hospitalizations in Door County due to the loss of home heating and cooling systems. Described below are the primary electric, natural gas, and other fuel sources that keep homes heated/cooled in Door County.

Electric Service

Except for a few small home-based alternative energy systems, all of the county's energy for electricity is imported from outside the county. Wisconsin Public Service (WPS) supplies the majority of power to Door County's residential, agricultural, commercial, and industrial customers, except for the Sturgeon Bay Utilities service area and the Town of Washington.

Sturgeon Bay Utilities (SBU) maintains an electric distribution system that services over 8,300 customers in the City of Sturgeon Bay and the Towns of Clay Banks, Nasewaupee, Sevastopol, and Sturgeon Bay. Utility staff members are responsible for maintaining three substations with current capacity of over 98 megawatts and over 281 miles of overhead and underground transmission lines. Over 3,300 transformers regulate the voltage measured by 9,400 meters used by its customers.

SBU is customer-owned and a member of Wisconsin Public Power, Inc. (WPPI). WPPI, created to provide reliable, low-cost power and services to its member/owners, is a regional power company serving 50 customer-owned electric utilities. Through WPPI, these public power utilities share resources and own generation facilities that provide reliable, affordable electricity to more than 190,000 homes and businesses in Wisconsin, Upper Michigan, and Iowa. WPPI supplies electricity to approximately 60 percent of the load served by municipal electric systems in Wisconsin, based on energy sales.

The Washington Island Electric Cooperative Inc., a private electric service utility established in 1945, serves approximately 700 year-round residents and 1,300 seasonal residents on Washington Island.

Most electric power for the county is transmitted along high voltage electric transmission lines owned and operated by the American Transmission Company (ATC). The ATC, formed in 2001, is a transmission- only utility that owns and operates approximately 9,350 miles of transmission lines and 500 substations. It serves approximately two-thirds of Wisconsin, including Door County. Four transmission lines run through Southern Door to the City. Only one transmission line serves all of northern Door County (north of the Dunn Road station). Major transmission lines within Door County include 138 kilovolt lines. Smaller electric transmission lines (69 kilovolt) also traverse throughout the county.

The ATC publishes an annual 10-year Transmission System Assessment Summary Report that outlines systems limitations and solutions for each of their five zones in Wisconsin. The September 2014 report recommends rebuilding a 69 kilovolt line between Dyckesville and the City, to be in service by the year 2016. ATC also plans to upgrade equipment at the Canal substation.

Natural Gas and Other Fuels

WPS provides natural gas service to the City of Sturgeon Bay and Southern and Central Door, including the Towns of Brussels, Forestville, Gardner, Nasewaupee, Sevastopol, Sturgeon Bay, and Union. County residents and businesses without natural gas service have individual on-site tanks for liquid propane or fuel oil, purchased from other private vendors. Wood stoves and pellet stoves have also become increasingly popular as energy costs rise and renewable energy sources receive greater attention in the media. Pellets are made from recycled sawdust, wood shavings, corn, walnut and peanut shells, and similar biomass wastes that are ground up, compressed, and extruded.

LOSS OF SEWER SYSTEM

A private septic system failure can cause pooling of sewage on the ground, which kids sometimes play in and get sick. Failure of a municipal sewer system can cause structural damage, as well as pose health risks. There no recorded deaths or hospitalizations in Door County due to failure of a sewer system.

STRUCTURAL FIRE

The Planning Team assigned structural fire a total of four points out of a possible nine points for level of risk. House fires pose a health risk primarily due to smoke inhalation and burns.

EMERGING INFECTIOUS DISEASES, INCLUDING PANDEMIC INFLUENZA

The Planning Team assigned communicable diseases a total of nine points out of a possible nine points for level of risk.

- **Meningitis** (3 occurrences reported in Door County between 1997 and 2014). Meningitis is an inflammation of the membranes (meninges) surrounding the brain and spinal cord. The swelling associated with meningitis often triggers the "hallmark" signs and symptoms of this condition, including headache, fever, and a stiff neck. Most cases of meningitis in the U.S. are caused by a viral infection, but bacterial and fungal infections also can lead to meningitis. Depending on the cause of the infection, meningitis can get better on its own in a couple of weeks or it can be a life-threatening emergency requiring urgent antibiotic treatment.

It's easy to mistake the early signs and symptoms of meningitis for the flu (influenza). Meningitis signs and symptoms may develop over several hours or over one or two days. The signs and symptoms that may occur in anyone older than the age of two include:

- sudden high fever
- severe headache that isn't easily confused with other types of headache
- stiff neck
- vomiting or nausea with headache
- confusion or difficulty concentrating
- seizures
- sleepiness or difficulty waking up
- sensitivity to light
- lack of interest in drinking and eating
- skin rash in some cases, such as in meningococcal meningitis

- **Tuberculosis** (7 TB and 34 latent TB occurrences reported in Door County between 1997 and 2014). Tuberculosis (TB) is a disease caused by germs that are spread from person to person through the air. TB usually affects the lungs, but it can also affect other parts of the body, such as the brain, the kidneys, or the spine. A person with TB can die if they do not get treatment. The general symptoms of TB disease include feelings of sickness or weakness, weight loss, fever, and night sweats. The symptoms of TB disease of the lungs also include coughing, chest pain, and the coughing up of blood. Symptoms of TB disease in other parts of the body depend on the area affected.

TB germs spread into the air when a person with TB disease of the lungs or throat coughs, sneezes, speaks, or sings. These germs can stay in the air for several hours, depending on the environment. Persons who

breathe in the air containing these TB germs can become infected; this is called latent TB infection. People with latent TB infection have TB germs in their bodies, but they are not sick because the germs are not active. These people do not have symptoms of TB disease, and they cannot spread the germs to others, however, they may develop TB disease in the future. They are often prescribed treatment to prevent them from developing TB disease.

People with TB disease have TB germs that are active, meaning that the germs are multiplying and destroying tissue in their body and can be spread to others. They usually, but not always, have symptoms of TB disease, which include those listed below. Drugs that can treat TB disease are available.

- a bad cough that lasts three weeks or longer
- pain in the chest
- coughing up blood or sputum
- weakness or fatigue
- weight loss
- no appetite
- chills
- fever
- sweating at night

- **Cryptosporidium** (33 cases of cryptosporidiosis reported in Door County between 1997 and 2014). Cryptosporidium is a microscopic parasite that causes the diarrheal disease cryptosporidiosis. Both the parasite and the disease are commonly known as "Crypto." There are many species of Cryptosporidium that infect animals, some of which also infect humans. The parasite is protected by an outer shell that allows it to survive outside the body for long periods of time and makes it very tolerant to chlorine disinfection. While this parasite can be spread in several different ways, water (drinking water and recreational water) is the most common way the parasite spreads.

Cryptosporidium is a leading cause of waterborne disease among humans in the United States. Cryptosporidium parasites are found in every region of the United States and throughout the world. Travelers to developing countries may be at greater risk for infection because of poorer water treatment and food sanitation. In the United States, an estimated 748,000 cases of cryptosporidiosis occur each year.

Crypto lives in the intestine of infected humans or animals that shed Cryptosporidium parasites in the stool. Millions of Crypto parasites can be released in a bowel movement from an infected human or animal. Shedding begins when the symptoms begin and can last for weeks after the symptoms (e.g., diarrhea) stop. Crypto may be found in soil, food, water, or surfaces that have been contaminated with the feces from infected humans or animals. Crypto is not spread by contact with blood. Crypto can be spread by:

- putting something in the mouth or accidentally swallowing something that has come in contact with the stool of a person or animal infected with Crypto
- swallowing recreational water or beverages contaminated with Crypto
- eating uncooked food contaminated with Crypto
- touching your mouth with contaminated hands

Contaminated water may include water that has not been boiled or filtered, as well as contaminated recreational water sources. Several community-wide outbreaks of cryptosporidiosis have been linked to drinking municipal water or recreational water contaminated with Cryptosporidium. Once infected, people with decreased immunity are most at risk for severe disease, depending on a person's degree of immune suppression.

- ***E. Coli*** (5 cases of Shiga Toxin-Producing occurrences reported in Door County between 1997 and 2014). Escherichia coli (*E. coli*) bacteria normally live in the intestines of people and animals. Most *E. coli* are harmless and actually are an important part of a healthy human intestinal tract. Some *E. coli* are pathogenic, however, meaning they can cause illness, either diarrhea or illness outside of the intestinal tract.

In 2002, the Door County Public Health Department began an extensive effort to monitor *E. coli* in the water at many beaches around Door County, largely due to the outbreak of a gastrointestinal illness traced back to one of the county's most popular beaches. In 2003, the Door County Soil & Water Conservation Department (SWCD) began identifying *E. coli* contamination sources at 31 beaches around the county, with a final report published in 2007. The final report concluded that storm water discharge during and after rain events is one of the clear sources of *E. coli* contamination in beach water throughout the county, with the most contaminated sources originating from onshore sources. Eleven beaches in nine different municipalities throughout the county were shown to have elevated *E. Coli* levels during or after rain events, the contamination likely due to the storm water discharge pipes located on or near the beaches. Since the 2007 report, the SWCD, through its Beach Contamination Reduction program, has worked with the county, City of Sturgeon Bay, Villages of Egg Harbor, Ephraim, and Sister Bay, and the Towns of Baileys Harbor, Gibraltar, Jacksonport, and Liberty Grove to develop construction plans to reduce stormwater contamination in public beach water.

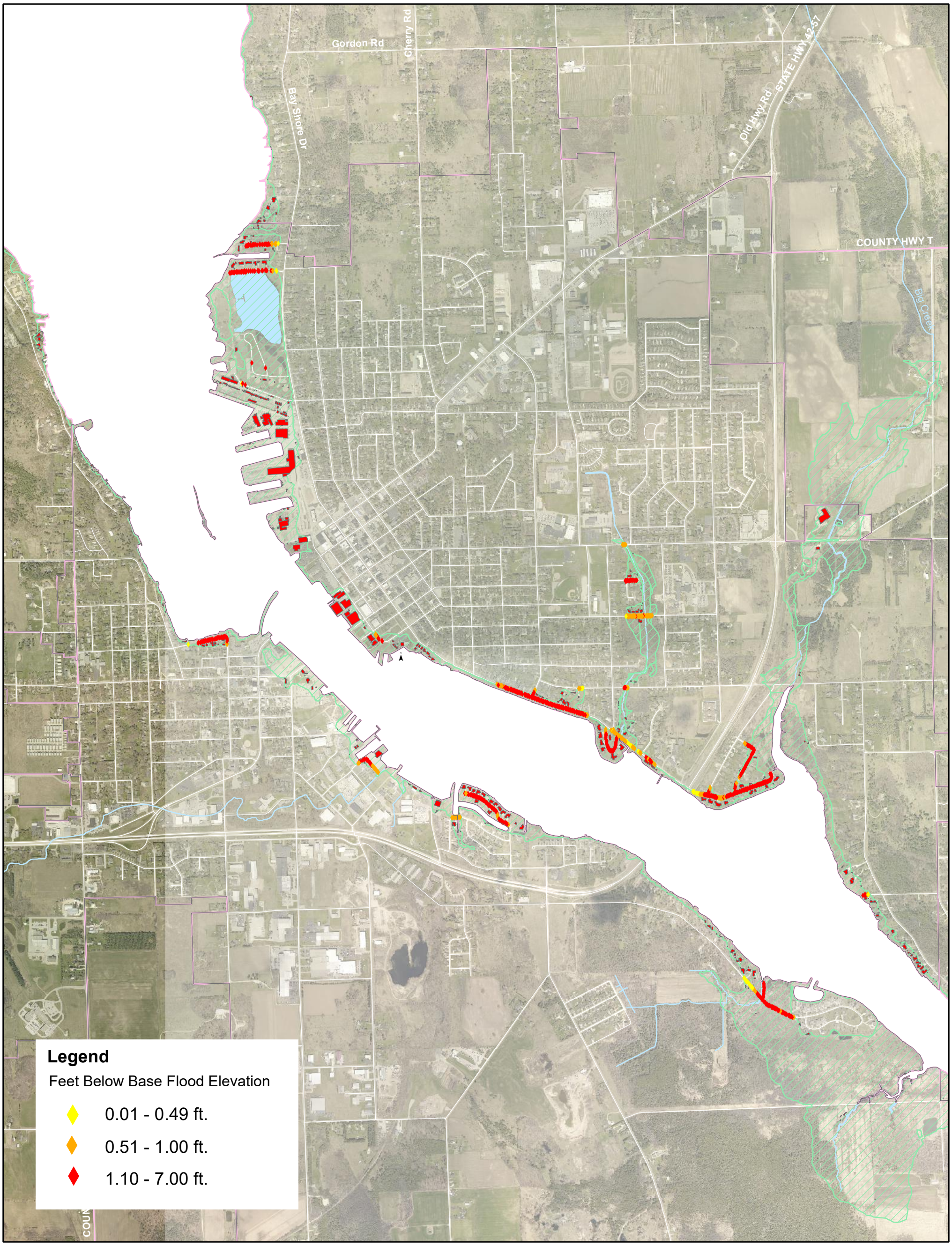
- **Pneumonia.** Pneumonia can be caused by viruses, bacteria, and fungi. In the United States, common causes of viral pneumonia are influenza and respiratory syncytial virus, and a common cause of bacterial pneumonia is *Streptococcus pneumoniae* (pneumococcus).

- **Norovirus.** Norovirus is very contagious, transmitted from an infected person, contaminated food or water, or by touching contaminated surfaces. The virus causes the stomach or intestines or both to get inflamed (acute gastroenteritis), leading to stomach pain, nausea, diarrhea, and vomiting. It is the most common cause of acute gastroenteritis in the United States. Norovirus illness can be serious, especially for young children and older adults. Each year, it causes 19-21 million illnesses and contributes to 56,000-71,000 hospitalizations and 570-800 deaths. Norovirus is also the most common cause of foodborne-disease outbreaks in the United States. The best way to help prevent norovirus is to practice proper hand washing and general cleanliness.

- **Influenza** (3 hospitalizations between 1996 and 2014)
  - Seasonal Flu. A contagious respiratory illness caused by influenza (flu) viruses occurring every year. It affects an average of 5 percent to 20 percent of the U.S. population by causing mild to severe illness, and in some instances can lead to death.
  - H1N1 Influenza (swine flu; 18 cases in 2009). H1N1 influenza is a respiratory disease of pigs caused by type A influenza viruses that cause regular outbreaks in pigs. People do not normally get H1N1 influenza, but human infections can and do happen. H1N1 influenza viruses have been reported to spread from person-to-person.
  - Avian Influenza. Commonly known as bird flu, this strain of influenza virus is naturally occurring in birds. Wild birds can carry the virus and may not get sick from it; however, domestic birds may become infected by the virus and often die from it.

Door County Multi-Jurisdictional Hazard Mitigation Plan

City of Sturgeon Bay (close-up)
Buildings within Flood Zone and
Road Markers Below Base Flood Elevation
DRAFT June 2021



Door County Multi-Jurisdictional Hazard Mitigation Plan

Buildings within Flood Zone and
Road Markers Below the Base Flood Elevation
Village of Egg Harbor
DRAFT June 2021

Legend

Feet Below Base Flood Elevation

- 0.01 - 0.49 ft.
- 0.51 - 1.00 ft.
- 1.10 - 7.00 ft.

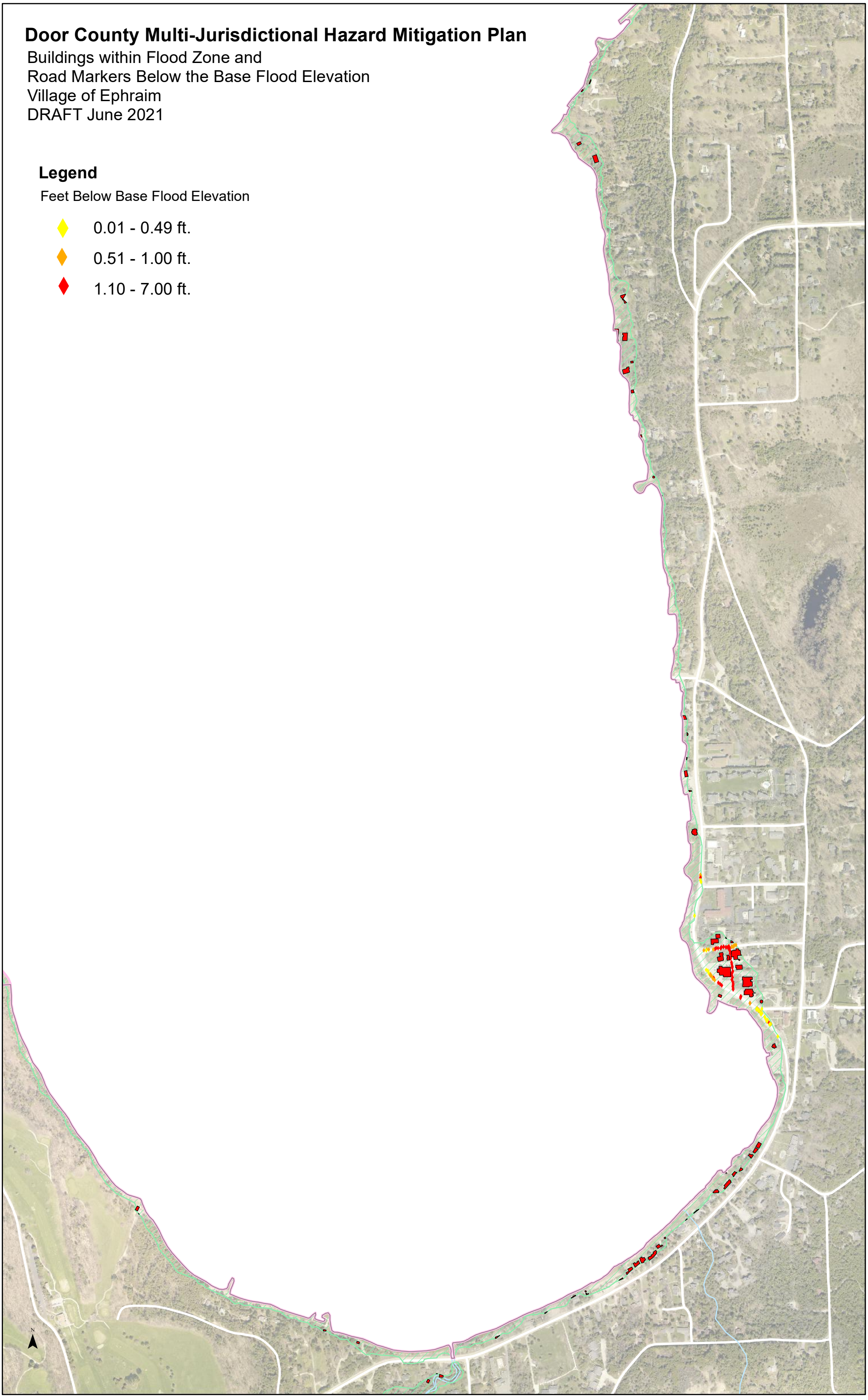
Door County Multi-Jurisdictional Hazard Mitigation Plan

Buildings within Flood Zone and
Road Markers Below the Base Flood Elevation
Village of Ephraim
DRAFT June 2021

Legend

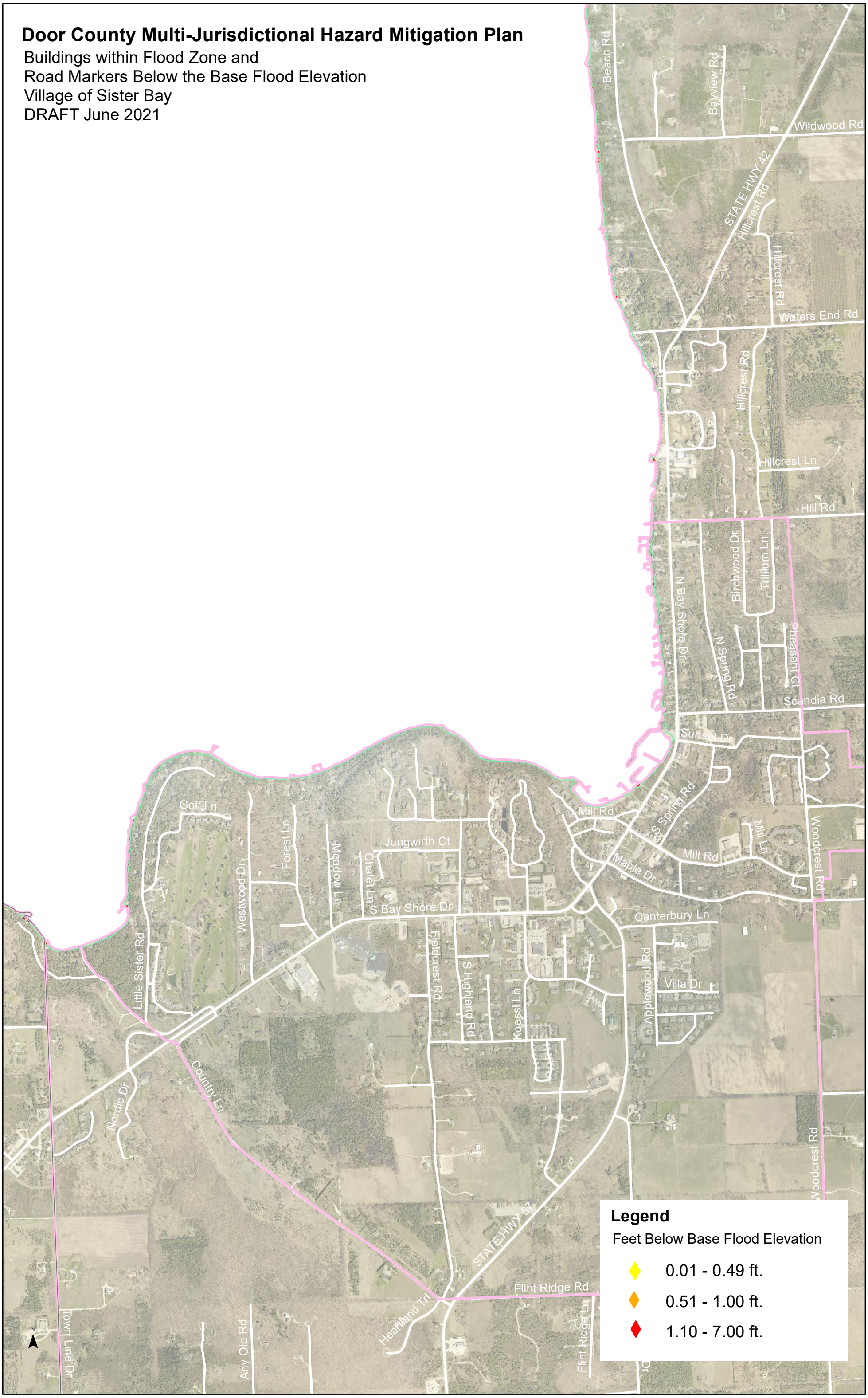
Feet Below Base Flood Elevation

- 0.01 - 0.49 ft.
- 0.51 - 1.00 ft.
- 1.10 - 7.00 ft.



Door County Multi-Jurisdictional Hazard Mitigation Plan

Buildings within Flood Zone and
Road Markers Below the Base Flood Elevation
Village of Sister Bay
DRAFT June 2021



APPENDIX D: MUNICIPAL FLOODPLAIN MAPS