CRISSP Expedited Risk Matrix

This risk matrix is part of the Climate Ready Infrastructure and Strategic Sites Protocol (CRISSP). More information can be found in the CRISSP Technical Guide on the Great Lakes and St. Lawrence Cities Initiative website (glslcities.org)

This self-assessment tool facilitates an understanding of the current status of a given facility relative to best practices. It also helps identify next steps to increase resiliency. The intent is to provide officials with a confidential tool to support planning efforts.

It is recommended that community officials first discuss which structures may be most vulnerable based on desktop reviews of available risk information such as flood maps. However, it is important to note that all critical infrastructure is at some risk to extreme weather and, therefore, should be subjected to the self-assessment process via the Risk Matrix. Infrastructure and facility managers (and their staff) are best positioned to apply the Risk Matrix. In so doing, it is important that they focus on both the impacts of the hazard on the physical structure, and on lifelines (e.g., utilities) that are necessary for operations.

In undertaking the assessment, the manager/operator of a critical facility or infrastructure, will complete all components of the Risk Matrix except for Part F (Risk to Strategic Sites). They should also ask themselves the question "*What keeps us up at night*?" to determine where the greatest vulnerabilities are and which scenarios are mostly likely to occur. Part F pertains specifically to strategic sites and should be completed by the manager/ operator, as appropriate.

In completing the Risk Matrix, it must be remembered that an extreme weather event impacting a facility or infrastructure typically has a cascading effect that can result in secondary impacts. Additionally, it is important to realize that threats due to climate change may be emerging and, therefore, can be addressed in a proactive manner.

Sections:

A. General Site Information
B. Identify Risk Areas (Geographic –specific)
C. Identify Risk from Other Hazards
D. Immediate Hazard Event Response Capability
E. Site-Specific Flood Risk Components
F. Risk to Strategic Sites

Format:

[Hazard/Risk Element]	**Record current status and comments here**
	[Suggested Mitigation Measures]

A. General Site Information

Location of your facility/site and basic description	
Purpose of site including key products and services	
Maximum number of people at site per day	
Number and type of vehicles at site per day	
Number of Structures *Buildings:* *Other:*	
Elevation: *Number of floors <u>above</u> ground*	
Elevation: *Number of floors <u>below</u> ground*	

B. Identify Risk Areas (Geographic –specific)

Is the main facility located in the FEMA regulated floodplain – either A or V (100-year), or shaded X or B zone (500-year)?	
	If critical action, protect to 500-year flood level. Consider meeting higher standards of Executive Order 13690, "Federal Flood Risk Management"

From Elevation Certificate, what is the Base Flood Elevation (A or V zone) and what are the elevations of the main facilities?	**Insert mitigation measure.*
Is there other vital utility infrastructure (e.g., electrical components) or facilities necessary for operating the main facility in the floodplain or below ground? *<u>For example</u>:* *Wastewater Treatment Plant (WWTP) – open lagoons, clarifiers, enclosed solids treatment, pumping stations, main sewer influent lines to plant – force mains. Water Treatment Plant (WTP) – pump stations, treated water supplies, water distribution system.*	*Consider elevating, floodproofing or relocating components above-ground but in floodplain, consider floodproofing or relocation for components below-ground*
Has either the main facility or connecting infrastructure (e.g., roads providing ingress/egress) ever experienced flooding on-site? In the general area?	**Insert mitigation measure.*
Are you located in an area that could be impacted by higher than average lake levels and/or coastal storms?	*Consider elevating, floodproofing or relocating facilities impacted by higher lake levels or coastal storms.*

If your facility uses a supervisory control and data acquisition (SCADA) system to operate, are components of this system vulnerable to flood and other hazards? *<u>For example</u>:* *Critical components at WWTP - level switches, pumps, pressure control valve for force mains.*	*Protect the room or facility with SCADA controls system from flooding. Remember to protect the SCADA system from cyber threats also.*
Where available, evaluate any studies that show specific climate change risk data for your area.	*Adjust mitigation measures accordingly.*

C. Identify Risk from Other Hazards

Are your facilities, including equipment on roofs or outside the main facility, vulnerable to high winds?	*Consider wind retrofit for building structure. Relocate or protect vulnerable equipment on the roof or building exterior. Protection could be building a small protective structure around equipment.*
Are there particular parts of your facility or infrastructure that are vulnerable to extreme heat? *Check roof areas for extreme heat damage and water sealants for leaks.*	*Consider increased energy efficiency (e.g., more shade trees, better building insulation).* *Maintain and replace water sealants causing leaks during rains.*

Are there particular parts of your facility or infrastructure that are vulnerable to extreme cold, icing, freezing, or excessive snowfall (e.g., snow loads on roof; freezing of pipes)?	*Consider a roof retrofit for snow (and also potentially wind and heat). Protect utilities on the exterior (roof and sides of buildings) and insulate any interior pipes that have freezing potential.*
Are the routes of the utility connections (e.g., electrical power lines) located in areas susceptible to damage by wind, ice or extreme heat?	*If possible, bury the utility lines on property or lessen the span of overhead wires. Secure back-up power supply.*

D. Immediate Hazard Event Response Capability

Does your facility/department have an emergency response plan? Does the plan include sources of outside assistance (e.g., Mutual Aid Agreement) during an emergency? *Your Emergency Response Team should provide temporary services to the public to stabilize the situation.*	*Prepare an emergency response plan if one does not exist, or update periodically if there is one. Develop a Mutual Aid Agreement with another facility or jurisdiction if one does not exist.*
Is your staff provided with specific roles and responsibilities during emergency response operations?	*If no assignments are made, consider formalizing roles and responsibilities and list them in an emergency response plan.*

Is someone on your staff assigned to daily weather monitoring during all shifts? Is there a reliable weather notification system (either external or on-site) available?	*Each facility and department should have someone assigned to weather monitoring via reliable weather news stations. The assigned person should have a method to communicate with other staff. The facility should consider obtaining notification systems (e.g., weather radios) to assist in monitoring.*
Has the emergency response plan been tested through an actual event or an exercise? Has the staff been trained to carry out their individual response roles and responsibilities?	*If the plan has not been tested, conduct (at the minimum) a tabletop exercise. Also, consider a functional and/or full-scale exercise. Urge training for all staff involved in emergency response.*
What materials are immediately available to construct an emergency flood barrier? Are these sufficient to install an emergency flood barrier to protect the facility?	*If sufficient material is not available, purchase emergency flood barriers (e.g., sandbags, inflatable bladder).*
Is there a designated storm shelter inside the facility for staff and visitors (e.g., emergency shelter, overnight shelter)?	*If no shelter space is designated, evaluate areas that would be appropriate to serve as shelter – both an emergency shelter (e.g., for events such as tornadoes) and an overnight shelter (e.g., for a winter storm).*
Have first responders, such as fire rescue personnel, visited the facility and know where key operational components are located?	*During an exercise, invite first responders to participate and have them tour the facility.*
Estimate the amount of time it takes a power outage to effect operations at your facility.	

Is there permissible downtime/ interruption to operations?	*If not, prepare a Continuity of Operations (COOP) Plan. Check insurance policies to see if the facility is adequately covered for interruptions due to potential hazard events.*
Does your facility have an adequate back-up power supply needed to support critical functions of the facility?	*If there is no back-up power supply, obtain a generator sufficient to maintain critical functions.*
What is the worst-case scenario involving a power outage at your facility?	*Prepare/update a business/operational continuity plan that addresses both diminished operations on-site, and relocation to another site during an emergency. Develop a worst-case scenario as a basis for plan development/update.*
Does the facility have a recovery plan that establishes repair priorities to restore operations rapidly?	*Prepare/update a recovery plan to ensure that repair priorities are clearly stated.*

E. Site-Specific Flood Risk Components

Are any sections/components (e.g., operation rooms, control panels, equipment, electrical) of the facility/ infrastructure elevated above grade?	*Determine whether components are elevated above the 500-year flood level, if included in FEMA mapped floodplain.*

Are any sections/components (e.g., operation rooms, control panels, equipment, electrical) below grade, such as tunnels leading to a wastewater plant?	*Consider protecting these components, if vulnerable: floodproof, elevate, or relocate to at least a 500-year flood level.*
Are there equipment and/or contents critical to the facility's operation (or potentially harmful if disturbed) at risk to flooding (i.e., either below the 100-year flood level or in areas that have been historically flooded)?	*Consider elevating or floodproofing this equipment/contents, or relocating to another elevated portion of the facility (e.g., from the 1st floor to the 2nd floor or another building outside the floodplain).*
Are ingress/egress routes (e.g., roads) protected/elevated if vulnerable to flooding?	*If not protected, elevate the road and construct culverts under the road with sufficient capacity to allow flood water to pass underneath without backing up.*
Any there any particular supply-chain vulnerabilities: a critical item such as fuel or a chemical needed for operations that may be blocked if the area is hit by disaster?	*Work with suppliers to discuss and develop contingency plans. When addressing potential ingress issues, include consideration of storing more of the critical item on-site.*
If your facility is inoperable, are there are any major secondary impacts to a developed area of natural resource? <u>For example</u>: If a wastewater treatment plant loses power, does it bypass into a lake or river?	*Insert mitigation measure.*

Does the facility have any underground or aboveground storage tanks that could become dislodged or ruptured and pose a risk to the facility or surrounding areas?	*Relocate the above-ground tank to a less hazardous area, secure or elevate it. For underground tanks, evaluate the potential for the tank to be dislodged from flooding. Consider anchoring or relocating vulnerable underground tanks. For both types of tanks, consider emergency shutoff valves.*
Does your facility have a sewage backflow prevention device?	*If not, consider installing one in all sewage lines to prevent sewage from backing up into the facility due to excessive pressure from floodwaters.*
Does the facility store or have in use any hazardous materials that need to elevated or secured?	

F. Risk to Strategic Sites

Is your site (natural or cultural) susceptible to flooding?	*Consider green infrastructure options for natural sites to control the level and location of floodwater. For cultural sites, consider appropriate nonstructural measures sensitive to the historical/cultural context.*
Is your site (natural or cultural) susceptible to high winds, extreme heat, or severe winter storms?	*For cultural sites, consider wind retrofit for buildings and, in particular, for vulnerable equipment that may be on the roof or on the exterior of the buildings. Research retrofit measures appropriate for historical/cultural context.*

If a wetlands area, is this area susceptible to potential future development?	*Protect wetlands through designation as a park, purchase and retirement of development rights, and/or conservation easement. For potential development, find alternative sites that are more suitable.*

G. Critical Dependencies

Select Infrastructure or utilities that, if subjected to a partial or total loss, would significantly impact operations. Questions to help identify key issues are listed under each utility. Single-point failures refer to a specific vulnerability in a single location that, if damaged, could disable the entire facility, or at least critical operations.

Power – *How long can the facility function without power?* – *Are there sources of back-up power or alternative energy supply? If so, please describe.* – *Is there an alternative site that serves this function while this site is being repaired?* – *Are there contracts in place to restore power?*	
Water – *What is the amount of time it takes an outage to effect operations at this site?* – *Is there a redundant water supply that can be provided to this site?* – *Are there back-up sources of water?* – *Are there contracts in place to restore water to this site?*	

Wastewater – *What is the amount of time it takes for an outage to effect operations?* – *Is there a redundant wastewater supply that can be provided to this site?* – *Are there back-up methods to deal with wastewater?* – *Are there contracts in place to restore wastewater to this site?*	
Natural Gas – *How critical is natural gas to the operations of the facility?* – *How long can the facility function without natural gas?* – *What is the worst-case scenario and where are the single-point failures?* – *Are there contracts in place to restore natural gas?* – *Does the facility have an emergency plan that establishes repair priorities?*	
Other Energy Sources (Petroleum Fuels) – *Does the facility depend on other energy sources other than power and natural gas?* – *How critical are these sources to the operations of the facility?* – *How long can the facility function without these sources?* – *What is the worst-case scenario and where are the single-point failures?* – *Are there contracts in place to restore these energy sources?* – *Does the facility have an emergency plan that establishes repair priorities?*	

Continuity / Supply Chain – *What critical supplies are needed on a daily/weekly/monthly basis for operation of the facility?* – *How critical are these supplies?* – *How long can the facility function without these supplies?* – *Are there contracts in place to restore the provisioning of these supplies or a back-up provider or an alternate delivery system?*	
Transportation – *What are the critical available transportation mode(s) to this facility (e.g., road, rail, navigable water)?* – *What is the amount of time it takes an outage to effect operations?* – *What is the worst-case scenario and where are the single-point failures?* – *Are there backup or redundant systems in place if the primary transportation routes are disrupted?* – *Does the facility have an emergency plan that establishes repair to the transportation infrastructure or rerouting priorities to the site?*	

Information Technology (SCADA, cyber) – *What critical information technologies service the facility?* – *What is the amount of time it takes an outage to effect operations?* – *What is the worst-case scenario and where are the single-point failures?* – *Are there backup or redundant systems in place if the primary systems are disrupted?* – *Does the facility have an emergency plan that establishes repair priorities?* – *Is there another site that can house the operations of this facility to ensure continuity of operations?*	
Telecommunications – *Which telecommunications are critical to operations at this site?* – *What is the amount of time it takes for an outage to effect operations?* – *What is the worst-case scenario and where are the single-point failures?* – *Are there backup or redundant systems in place if the primary systems are disrupted?* – *Does the facility have an emergency plan that establishes telecommunication repair priorities?*	

What are the impacts to your community if your facility is damaged to the point of not being able to operate? – *What loss of services are likely to result, and how would this impact the community?* – *Are there specific demographic groups that would be most impacted?* – *Are there back-up or alternative service suppliers that can address needs during the disruption?* – *Does your facility have a continuity of operations plan?*	

H. Long Term Mitigation

What is the greatest need for mitigation?	
Are there current plans to mitigate vulnerable parts of the facility/ infrastructure?	
	Consider including a mitigation strategy in an existing and anticipated capital improvement plans. Support community efforts for larger mitigation projects such as green infrastructure and drainage improvements.