

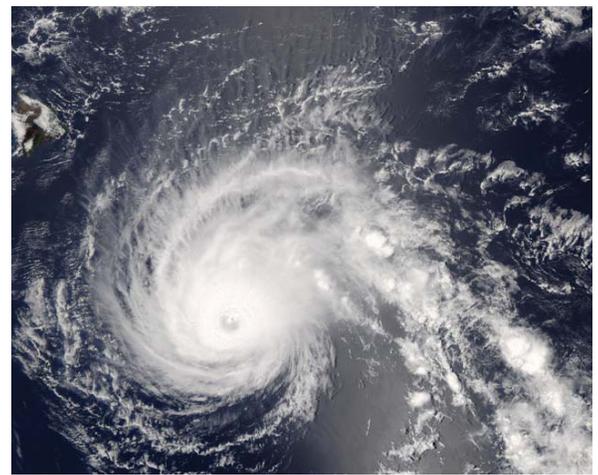
Incident Action Checklist – Hurricane

The actions in this checklist are divided up into three “rip & run” sections and are examples of activities that water and wastewater utilities can take to: prepare for, respond to and recover from hurricanes. For on-the-go convenience, you can also populate the “My Contacts” section with critical information that your utility may need during an incident.

Hurricane Impacts on Water and Wastewater Utilities

A hurricane is a severe tropical cyclone with sustained winds of 74 miles per hour or greater. Hurricanes and tropical storms have the potential to cause a great deal of damage to drinking water and wastewater utilities due to heavy rainfall and inland flooding, coastal storm surge, and high winds. Typical impacts that may lead to service interruptions include, but are not limited to:

- Pipe breaks due to washouts, up-rooted trees, etc., which could result in sewage spills or low water pressure throughout the service area
- Loss of power and communication infrastructure due to high winds
- Combined sewer overflows (CSOs) due to flooding
- Restricted access to facilities and collection and distribution system assets due to debris and flood waters
- Loss of water quality testing capability during the storm due to restricted facility and laboratory access and damage to utility equipment



NOAA

The following sections outline actions water and wastewater utilities can take to prepare for, respond to and recover from hurricanes.

Examples of Hurricane and Water Sector Impacts and Response

Superstorm Sandy Response

Utilities from Florida to Maine were very active in monitoring and preparing for landfall of Superstorm Sandy in October 2012. More than 690 drinking water and wastewater utilities across 11 states and Washington, D.C., experienced impacts from the storm. Water/Wastewater Agency Response Network (WARN) responses included significant communication with utilities to assess operational conditions and fulfill resource requests, such as the following:

- **MAWARN**—West Boylston Water District provided generator support to Northboro Department of Public Works for a sewer pump station.
- **NJWARN**—Coordination of generator needs with New Jersey Office of Emergency Management (NJOEM) and the Emergency Management Assistance Compact (EMAC), and notice of need to surrounding WARNs of anticipated resource requests.
- **NYWARN**—Bethpage Water District provided Mill Neck Estates Water Supply with chlorination equipment via rowboat, as no other means of delivery was possible. Onondaga County Wastewater Agency provided a chainsaw crew to support New York City Department of Environmental Protection (NYCDEP) facility access. NYWARN provided informational support to the US Army Corp of Engineers (USACE), Brooklyn Joint Field Office.
- **PAWARN**—Erie Water Works responded to generator request from Lehigh County Authority within 13 minutes of request and unit was operating onsite in less than 24 hours.

Source: AWWA “[Superstorm Sandy After Action Report, 2013.](#)”

My Contacts and Resources



CONTACT NAME	UTILITY/ORGANIZATION NAME	PHONE NUMBER
	Local EMA	
	State EMA	
	State Primacy Agency	
	WARN Chair	
	Power Utility	

Planning

- Incident monitoring:
 - [National Hurricane Center](#) (National Oceanic and Atmospheric Administration [NOAA])
 - [Quantitative Precipitation Forecasts](#) (NOAA)
 - [Excessive Rainfall Forecasts](#) (NOAA)
 - [River Observations, Forecasts, and Experimental Long-Range Flook Risk](#) (NOAA)
 - [Flood Inundation Mapper](#) (United States Geological Survey [USGS])
 - [WaterNow](#) (USGS)
 - [WaterAlert](#) (USGS)
 - [WaterWatch](#) (USGS)
- [Saffir-Simpson Hurricane Wind Scale](#) (NOAA)
- [Tropical Cyclones: A Preparedness Guide](#) (NOAA)
- [Map Service Center to find flood map by address](#) (Federal Emergency Management Agency [FEMA])
- [National Weather Service Weather Alerts](#) (NOAA)
- [Planning for an Emergency Drinking Water Supply](#) (EPA)
- [All-Hazard Consequence Management Planning for the Water Sector](#) (Water Sector Emergency Response Critical Infrastructure Partnership Advisory Council [CIPAC] Workgroup)
- [Vulnerability Self Assessment Tool \(VSAT\)](#) (EPA)
- [Preparing for Extreme Weather Events: Workshop Planner for the Water Sector](#) (EPA)

- [Tabletop Exercise Tool for Water Systems: Emergency Preparedness, Response, and Climate Resiliency](#) (EPA)
- [How to Develop a Multi-Year Training and Exercise \(T&E\) Plan](#) (EPA)
- [Make a Plan](#) (FEMA)

Coordination

- [Water/Wastewater Agency Response Network \(WARN\)](#) (EPA)
- [Community Based Water Resiliency](#) (EPA)

Facility and Service Area

- [Emergency Response and Preparedness Florida WARN Best Management Practices for Water and Wastewater Systems](#) (University of Florida Center for Training)
- [What to Do After the Flood](#) (EPA)

Power, Energy and Fuel

- [EPA Region 1 Water/Wastewater System Generator Preparedness Brochure](#) (EPA)

Documentation and Reporting

- [Federal Funding for Utilities In National Disasters \(Fed FUNDS\)](#) (EPA)

Mitigation

- [Climate Resilience Evaluation and Awareness Tool \(CREAT\)](#) (EPA)
- [Adaptation Strategies Guide](#) (EPA)

Actions to Prepare for Hurricane Season



Planning

- Review and update your utility's emergency response plan (ERP), and ensure all emergency contacts are current.
 - Conduct briefings, training and exercises to ensure utility staff is aware of all preparedness, response and recovery procedures.
 - Identify priority water customers (e.g., hospitals), obtain their contact information, map their locations and develop a plan to restore those customers first.
 - Develop an emergency drinking water supply plan and establish contacts (potentially through your local emergency management agency (EMA) or mutual aid network) to discuss procedures, which may include bulk water hauling, mobile treatment units or temporary supply lines, as well as storage and distribution.
 - Conduct a hazard vulnerability analysis in which you review historical records to understand the past frequency and intensity of hurricanes and how your utility may have been impacted. Consider taking actions to mitigate hurricane impacts to the utility, including those provided in the "Actions to Recover from a Hurricane: Mitigation" section.
 - Complete pre-disaster activities to help apply for federal disaster funding (e.g., contact state/local officials with connections to funding, set up a system to document damage and costs, take photographs of the facility for comparison to post-damage photographs).
- Outlining response activities, roles and responsibilities and mutual aid procedures (e.g., how to request and offer assistance)
 - Conducting joint tabletop or full-scale exercises
 - Obtaining resources and assistance, such as equipment, personnel, technical support or water
 - Establishing interconnections between systems and agreements with necessary approvals to activate this alternate source. Equipment, pumping rates and demand on the water sources need to be considered and addressed in the design and operations
 - Establishing communication protocols and equipment to reduce misunderstandings during the incident
- Coordinate with other key response partners, such as your local EMA, to discuss:
 - How restoring system operations may have higher priority than establishing an alternative water resource
 - Potential points of distribution for the delivery of emergency water supply (e.g., bottled water) to the public, as well as who is responsible for distributing the water
- Understand how the local and utility emergency operations center (EOC) will be activated and what your utility may be called on to do, as well as how local emergency responders and the local EOC can support your utility during a response. If your utility has assets outside of the county EMA's jurisdiction, consider coordination or preparedness efforts that should be done in those areas.

Coordination

- Join your state's Water/Wastewater Agency Response Network (WARN) or other local mutual aid network.
- Coordinate with WARN members and other neighboring utilities to discuss:
 - Ensure credentials to allow access will be valid during an incident by checking with local law enforcement.
 - Sign up for mobile and/or email alerts from your local EMA, if available.



Communication with Customers

- Develop outreach materials to provide your customers with information they will need during a hurricane (e.g., clarification about water advisories, instructions for private well and septic system maintenance and information about hurricane mitigation).
- Review public information protocols with local EMA and public health/primacy agencies. These protocols should include developing water advisory messages (e.g., boil water, warnings that service disruptions are likely) and distributing them to customers using appropriate mechanisms, such as reverse 911 calling. Keep in mind that the notice may need to be delivered prior to the storm to be effective.

Facility and Service Area

- Inventory and order extra equipment and supplies, as needed:
 - Motors
 - Fuses
 - Chemicals (ensure at least a two week supply)
 - Cellular phones or other wireless communications device
 - Emergency Supplies
 - Tarps/tape/rope
 - Cots/blankets
 - First aid kits
 - Foul weather gear
 - Plywood
 - Flashlights/flares
 - Sandbags (often, sand must be ordered as well)
 - Bottled water
 - Batteries
 - Non-perishable food

- Ensure communication equipment (e.g., radios, satellite phones) works and is fully charged.
- Develop a GIS map of all system components and prepare a list of coordinates for each facility.
- Document pumping requirements and storage capabilities, as well as critical treatment components and parameters.

Power, Energy and Fuel

- Ask the local power utility to trim tree branches near power lines.
- Evaluate condition of electrical panels to accept generators; inspect connections and switches.
- Document power requirements of the facility; options for doing this may include:
 - Placing a request with the US Army Corps of Engineers 249th Engineer Battalion (Prime Power): <http://www.usace.army.mil/249thEngineerBattalion.aspx>
 - Using the US Army Corps of Engineers on-line Emergency Power Facility Assessment Tool (EPFAT): <http://epfat.swf.usace.army.mil/>
- Confirm and document generator connection type, capacity load and fuel consumption. Test regularly, exercise under load and service backup generators.
- Contact fuel vendors and inform them of estimated fuel volumes needed if utility is impacted. Determine your ability to establish emergency contract provisions with vendors and your ability to transport fuel if re-fueling contractors are not available. Develop a backup fueling plan and a prioritization list of which generators to fuel in case of a fuel shortage.
- Collaborate with your local power provider and EOC to ensure that your water utility is on the critical facilities list for priority electrical power restoration, generators and emergency fuel.

Actions to Respond to a Hurricane: Pre-landfall Activities



Planning

- Actively monitor hurricane activity.

Facility and Service Area

- Secure equipment; move electronics, equipment and important data to a water-tight facility or out of flood-prone areas. Determine areas outside of the floodplain where vehicles/equipment can be moved.
- Clear storm drains and set up sandbags to protect facilities in flood-prone areas. Place sandbags on the top of tanks so that backwash water is directed away from plant structures.
- Check that back-up equipment and facility systems, such as controls and pumps, are in working order, and ensure that the utility has a two week supply of all chemicals on hand.
- Protect exposed lines or pipes that may become vulnerable due to streambank erosion.
- Fill storage tanks to full capacity to maximize storage and fill empty chemical storage tanks with water if a heavy precipitation event is anticipated, to prevent floating.
- Wastewater utilities should empty holding tanks, ponds and/or lagoons to prepare for an increase in flow and to minimize the chance of a release during heavy weather incidents.

Personnel

- Identify essential personnel and ensure they are trained to perform critical duties in an emergency (and possibly without communication), including the shut down and start up of the system.
- Establish communication procedures with essential and non-essential personnel. Ensure all personnel are familiar with emergency evacuation and shelter in place procedures.
- Pre-identify emergency operations and clean-up crews. Establish alternative transportation strategies if roads are impassable.
- Consider how evacuations or limited staffing due to transportation issues (potentially all utility personnel) will impact your response procedures.
- Identify possible staging areas for mutual aid crews if needed in the response, and the availability of local facilities to house the crews.
- Encourage personnel, especially those that may be on duty for extended periods of time, to develop family emergency plans.

Power, Energy and Fuel

- Fuel vehicles and fill fuel tanks to full capacity and ensure that you have the ability to manually pump gas in the event of a power outage. Ensure this equipment and other hazardous stored materials are located in a safe zone.





Coordination

- Notify your local EMA and state regulatory/primacy agency of system status.
- If needed, request or offer assistance (e.g., equipment, personnel) through mutual aid networks, such as WARN.
- Assign a representative of the utility to the incident command post or the EOC for the community.

Communication with Customers

- Notify customers of any water advisories and consider collaborating with local media (television, radio, newspaper, etc.) to distribute the message. If emergency water is being supplied, provide information on the distribution locations.

Facility and Service Area

Overall

- Conduct damage assessments of the utility to prioritize repairs and other actions.
- Check that back-up equipment and facility systems, such as controls and pumps, are in working order, and ensure that chemical containers and feeders are intact.

Drinking Water Utilities

- Inspect the utility and service area for damage due to debris, downed trees and flood waters. Identify facility components (e.g., valve boxes) and fire hydrants that have been buried or are inaccessible.
- Ensure pressure is maintained throughout the system and isolate those sections where it is not.
- Isolate and control leaks in water transmission and distribution piping.
- Turn off water meters at destroyed homes and buildings.
- Monitor water quality, develop a sampling plan and adjust treatment as necessary.
- Notify regulatory/primacy agency if operations and/or water quality or quantity are affected.
- Utilize pre-established emergency connections or setup temporary connections to nearby communities, as needed. Alternatively, implement plans to draw emergency water from pre-determined tanks or hydrants. Notify employees of the activated sites.



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Notes:

Actions to Respond to a Hurricane: Post-landfall Activities

(continued)



Wastewater Utilities

- Inspect the utility and service area, including lift stations, for damage, downed trees, and power availability. Inspect the sewer system for debris and assess the operational status of the mechanical bar screen. If necessary, run system in manual operation.
- Inspect all manholes and pipelines in flood-prone areas for inflow and infiltration after water recedes.
- Consider suspending solid waste processing during periods of high flow to conserve bacteria and prevent it from washing out of the plant.
- Notify regulatory/primacy agency of any changes to the operations or required testing parameters.

Documentation and Reporting

- Document all damage assessments, mutual aid requests, emergency repair work, equipment used, purchases made, staff hours worked and contractors used during the response to assist in requesting reimbursement and applying for federal disaster funds. When possible, take photographs of damage at each work site (with time and date stamp). Proper documentation is critical to requesting reimbursement.
- Work with your local EMA on the required paperwork for public assistance requests.

Personnel

- Account for all personnel and provide emergency care, if needed. Caution personnel about known hazards resulting from hurricanes.
- Deploy emergency operations and clean-up crews. Identify key access points and roads for employees to enter the utility and critical infrastructure; coordinate the need for debris clearance with local emergency management or prioritize it for employee operations.

Power, Energy and Fuel

- Use backup generators, as needed, to supply power to system components.
- Monitor and plan for additional fuel needs in advance; coordinate fuel deliveries to generators.
- Maintain contact with electric provider for power outage duration estimates.



FEMA

Notes:

Actions to Recover from a Hurricane



Coordination

- Continue work with response partners to obtain funding, equipment, etc.

Communication with Customers

- Assign a utility representative to continue to communicate with customers concerning a timeline for recovery and other pertinent information.

Facility and Service Area

- Complete damage assessments.
- Complete permanent repairs, replace depleted supplies and return to normal service.

Documentation and Reporting

- Compile damage assessment forms and cost documentation into a single report to facilitate the sharing of information and the completion of state and federal funding applications. Visit EPA's web-based tool, Federal Funding for Utilities—Water/Wastewater—in National Disasters (Fed FUNDS), for tailored information and application forms for various federal disaster funding programs: <http://water.epa.gov/infrastructure/watersecurity/funding/fedfunds/>

- Develop a lessons learned document and/or an after action report (AAR) to keep a record of your response activities. Update your vulnerability assessment, ERP and contingency plans.

- Revise budget and asset management plans to address increased costs from response-related activities.

Mitigation

- Identify mitigation and long-term adaptation measures that can prevent damage and increase utility resilience. Consider impacts related to the increased frequency of intense hurricanes when planning for system upgrades. Examples of successful mitigation projects by water and wastewater utilities include:
 - Provide protection to electrical substation and transformers that would be in danger of failing during a floods, storm surges and high winds
 - Retrofit sanitary sewer lift stations with electrical connections for portable generators to maintain operations during power outages
 - Elevate generators, fuel tanks, critical controls, motors and blowers to protect against coastal storm surges
 - Replace existing entry doors with heavy-duty, impact-resistant doors and install electric roll-down storm window shutters to protect against flying debris that is associated with hurricane force winds

Notes: