

NYS RESILIENCY INSTITUTE FOR STORMS & EMERGENCIES (NYS RISE)

Consortium of Stony Brook University, New York University, Columbia University, Cornell University, CUNY, and Brookhaven National Laboratory
Phase I (10/1/2013 - 3/31/2014)

Work Unit 2.4 Flooding Impacts on Freshwater Distribution System

Workshop Presentation, March 27, 2014

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WORK UNIT 2.4. WORK PLAN

- Formulation and identification of
 - (a) generic impacts of flooding on water supply system components for water delivery,
 - (b) vulnerabilities of water supply systems to flooding, and
 - (c) interdependencies between water supply and other infrastructures
- Location of key water supply systems and components damaged from flooding in previous storm-related flooding events
- Identification of NYS water supply sites, collection and distribution systems prone to flooding with a flood-prone area overlay
- Recommendations and conclusions for water supply resiliency
- Preliminary projection of resiliency issues due to climate change



WORK UNIT 2.4. SUMMARY OF OVERALL ACCOMPLISHMENTS

- Water supply system components are being identified through a literature review and a risk-ranking system based on the potential for flooding during storms and emergencies and potential for impairment due to dependencies on electric power. A preliminary list by function includes electric power driven components, particularly pumps and water supply treatment systems and by location, facilities in low-lying areas unprotected from floods.
- Representative water supply systems, primarily surface water dependent in upper NYS and groundwater dependent on Long Island), have been identified for in-depth vulnerability analysis (e.g., electric power dependencies), from hurricane reports. Surface water dependent systems include Poughkeepsie (affected by Hurricane Sandy), Albany, Syracuse, and Rochester (affected by Hurricane Agnes and more recent flooding).
- Database construction has begun from available water supply system inventories that have been obtained and are maintained by the U.S.EPA and NYS DOH. The database contains zip-code level identifiers and supply source for each NYS system that can be combined with flooding data through ArcGIS to identify systems vulnerable to flooding.
- Evaluation of measures for plant protection and conveyance system improvements has begun as a basis for recommendations for improved service.



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WORK UNIT 2.4. SELECTED PRELIMINARY OBSERVATIONS AND FINDINGS: STATEWIDE

According to NYS Department of Health (NYS DOH)'s 2013 water supply database:*

- NYS has 2,911 community public water systems with a population served of 18,361,750, accounting for 31% of all NYS systems and 85.5% of the population served by public water systems.
- NYS has 588 systems that rely directly on surface water (not including purchased surface water) serving a population of 12,505,823, accounting for 6.3% of systems, but 58.2% of the population served. Most systems relying on groundwater are on Long Island.

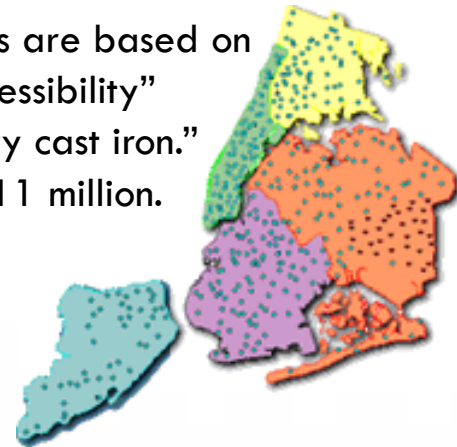
*Source: computed from NYS DOH (July 2013) Drinking Water Program: Facts and Figures

A listing of these entities has been obtained from a U.S. EPA database with zip code location and contact information to locate those sites and combine them with flood area locations.

Maintaining the integrity of water quality depends on the water quality sampling program to capture impacts of storm events on quality. According to NYC DEP**:

- Since March 1997, NYC DEP has maintained 965 sampling stations. Locations are based on “population density, water pressure zones, proximity to water mains, and accessibility”
- “The stations rise about 4 1/2 feet above the ground and are made of heavy cast iron.”
- The total cost of installation and construction of the stations is estimated at \$11 million.

**Source: http://www.nyc.gov/html/dep/html/drinking_water/sampling.shtml



WORK UNIT 2.4. SELECTED PRELIMINARY OBSERVATIONS AND FINDINGS: SUBAREAS

A review of New York City and New York State reports shows that the portion of the New York City water supply system within and owned by the City was largely unaffected by Hurricane Sandy, however, a number of vulnerabilities exist. According to the report ***A Stronger, More Resilient New York***:*

- Many high-rise buildings in NYC rely on pumps to provide water above the seventh floor, and power outages affect pumping capability. This area is the NYC Buildings Department jurisdiction.
- The reliance of fire-fighting on drinking water sources is common, and facilities such as hydrants are subject to physical damage, flooding, and corrosion, reducing their fire-fighting (e.g., Breezy Point),
- Future storm events characterized by heavy downpours may also be challenging since these events can result in increased runoff which adds pathogens, contaminants and turbidity to the water in the reservoirs used by the city.

*See: http://nytelecom.vo.llnwd.net/o15/agencies/sirr/SIRR_singles_Hi_res.pdf , Bill Gustin 04/01/2013 Changes in High-Rise Buildings: Is It Time to Change Your Procedures? Fire Engineering. <http://www.fireengineering.com/articles/print/volume-166/issue-4/features/changes-in-high-rise-buildings-is-it-time-to-change-your-procedu.html>

In other NYS areas, numerous water supply systems north of NYC experienced component disruptions

- During Hurricanes Irene and Lee NYS set up a fund (HELP) recognizing water supply system needs
- Numerous water supply components were flooded, exemplified by Poughkeepsie**
- Rochester water supply has been severely damaged by hurricanes and flooding.

SIRR, p. 214



**Alstadt and Morris
11/12/12,
Poughkeepsie flooded
pump well



Turbid water spilling from the Cannonsville Reservoir, Delaware County, NY, June 2006

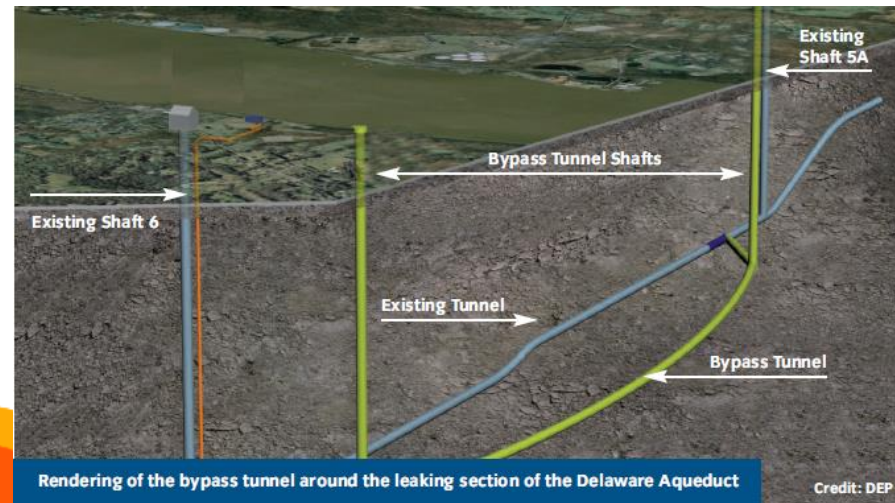
Credit: DEP

WORK UNIT 2.4. SELECTED PRELIMINARY OBSERVATIONS TO IMPROVE RESILIENCY

A portfolio of strategies exists to improve water supply resiliency:

- New York City already identified measures to increase flexibility of the NYC upstate water supply storage and distribution system (SIRR, p. 218*), that can serve as a model for other areas.
- For Hurricanes Irene and Lee, NYS set up a Hurricane Emergency Loan Program (HELP) that included water supply systems
- NYS has allocated \$56 million from its Disaster Assistance Program Allocation from The Disaster Relief Appropriations Act of 2013 (P.L. 113-2) for drinking water
- Methods for short- and long-term protection identified for wastewater apply to water supply (elevation, flood-proofing, barriers, etc.).
- Alternative water supplies exist should power fail (Poughkeepsie).
- Maintain emergency staffing/resources.

*See: http://nytelecom.vo.llnwd.net/o15/agencies/sirr/SIRR_singles_Hi_res.pdf



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SIRR, p. 218*