Central Johnston County Regional Wastewater Treatment Plant
Recovery from Hurricane Matthew Flooding
July 2017

Johnston County Department of Utilities

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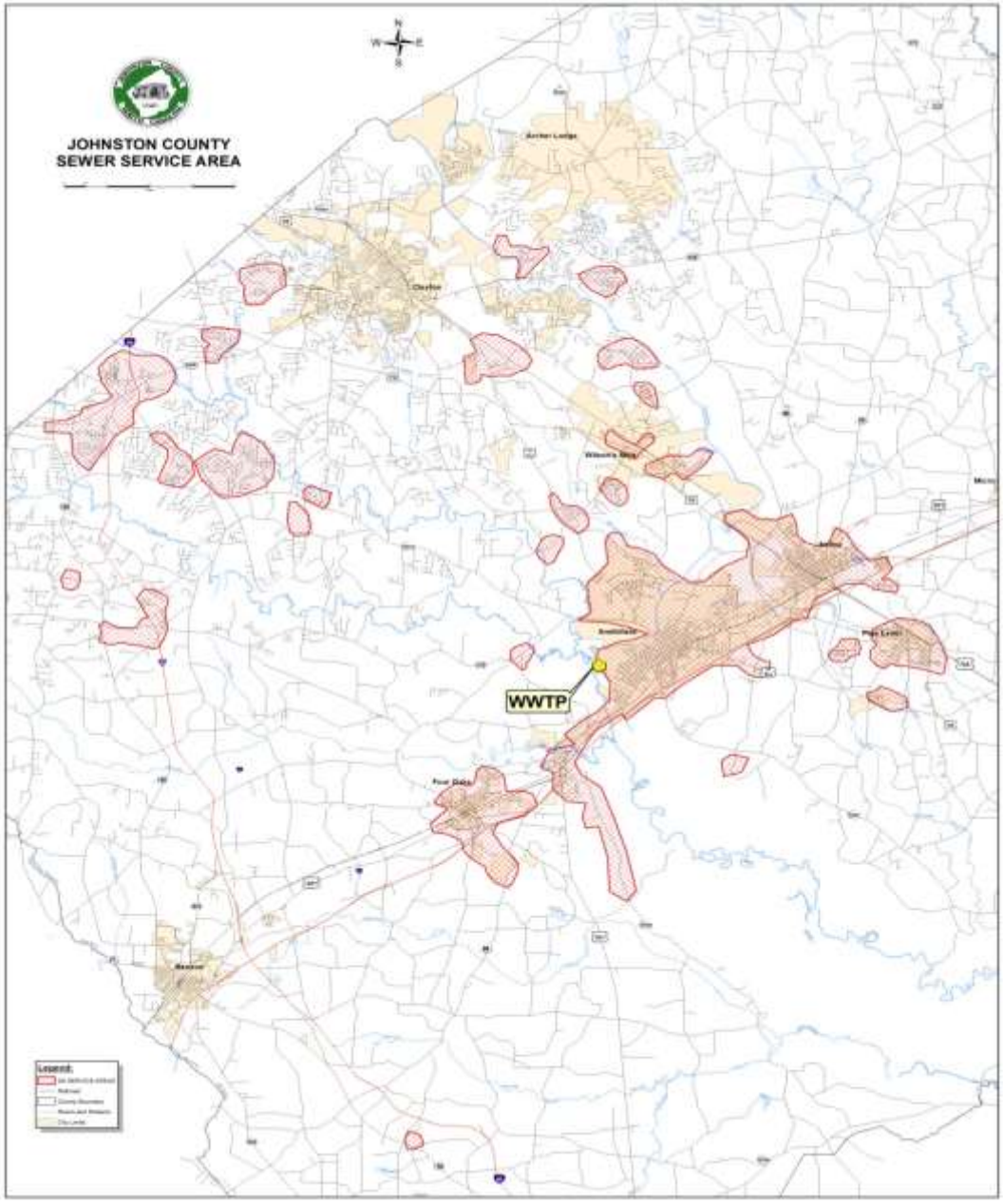
Central Johnston County Regional Wastewater Treatment Plant

County Sewer Service Areas and WWTP Location



FEMA NFIP Map

100 yr. flood stage -	El. 124.6
Top of dike -	El. 127.5
500 yr. flood stage -	El. 130.0

Central Johnston County Regional Wastewater Treatment Plant

Location:	Smithfield	
Capacity:	9.5 MGD	
Current Avg. Flow:	5.3 MGD	
Process:	Advanced tertiary – Modified Ludzack Ettinger with denitrification filters and chemical P removal	
Effluent Limits:	BOD	5.0/10.0 mg/l
	TSS	30.0 mg/l
	NH_3	2.0/1.0 mg/l
	TN	2.4 mg/l (71.477 lbs/yr)
	TP	2.0
Receiving Stream:	Neuse River	
Bulk Customers:	5 Municipalities and 1 private utility	
Retail Customers:	5,000	
Reclaimed Water System:	0.35 MGD	

Hurricane Matthew Storm Event

October 8, 2017 – 14” to 17” of rainfall across County

- 76 State roads breached by stream overtopping
- 34 Water mains washed out by road breaches
- 6 Wastewater pump stations out of service due to flooding
- 18 Sewer spills

October 9, 2017 – NOAA forecast major flooding on the Neuse with a crest of 129.5 ft. in Smithfield on October 10

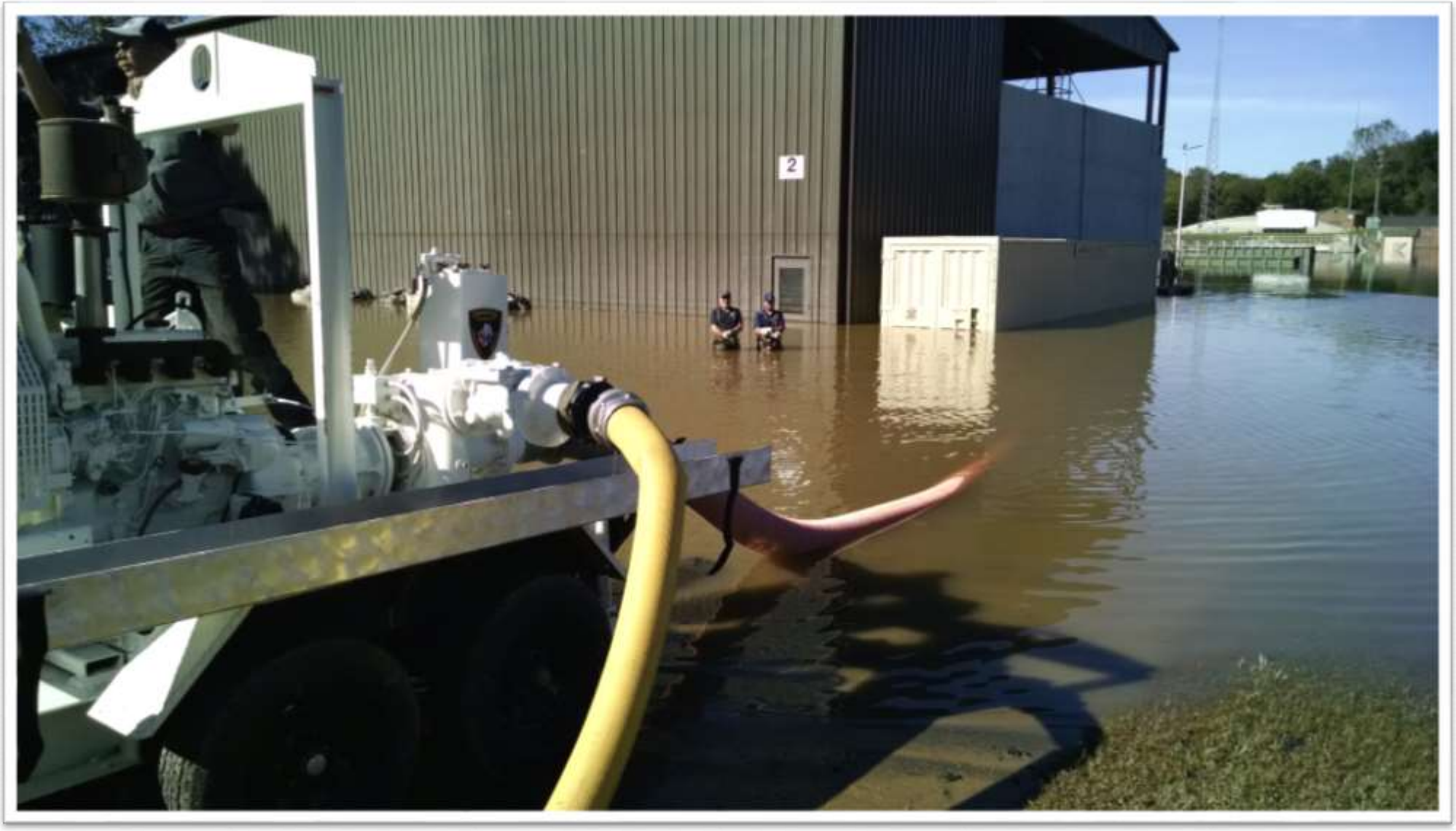
- 10:00 AM - As river level rises, plant staff are mustered to move equipment and supplies to high(er) ground
- 10:00 PM - WW Treatment Manager and WWTP Superintendent disconnect all power to all process equipment and instruct Smithfield Power to disconnect supply to plant
- 10:30 PM - River overtops flood protection dike and plant entrance road. The plant is abandoned.

October 10, 2017 – 2:30 AM – River level reaches 128.5 ft. at County wwtp site


Admiral Nelson's
MIST
Tito's
Handmade
ABSOLUT
VODKA


Good bye WWTP.
We gave it our best!!
William D. P. W.
Wayne David
Mathew Mike
Chase Phil
Terry Chad
Jenifer
We will
be back.
10-8-16

16 Hours After River Flood Crest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Facilities Off Line Due to Water Damages

- 33% of influent pump capacity
- 25% of aeration volume
- 70% of blower capacity
- All clarifiers
- All RAS pumps
- Denitrification filter influent pumps
- Denitrification filters and backwash basin
- 60% of SCADA panels
- Bulk chemical tanks
- Chemical feed pumps
- Operators' building
- Shop and warehouse

Initial Recovery Steps

Before river crested:

- Move all vehicles, wheeled equipment, spare equipment, and supplies to high(er) ground.
- Plan strategy for plant abandonment.
- Contact contractors with plant flooding recovery experience and verbally retain them for assistance. One general contractor and one electrical contractor are selected.
- Arrange with County Emergency Management Department to provide large dewatering pumps and fans.
- Fuel plant generators and mobile generators.
- Hope for the best and pray for mercy.

Initial Recovery Steps

After river level drops below top of dike:

- Begin pumping to dewater “bowl”.
- After initial dewatering, managers, engineer, and supervisors perform a walk through and assess damages.
- GC is mobilized and staff begin washing down, “spot” dewatering, and forced air drying of mechanical and electrical equipment.
- Electrical integrity testing of circuit breakers and major power distribution circuits is begun.
- Integrity testing of motor starters and VFD’s is begun.
- Electrical integrity investigations of submersible pumps is started.
- County’s wastewater engineering consultant is retained for guidance and assistance in electrical equipment troubleshooting and validation.
- An *initial* step-by-step plan is developed to get the plant operational – first for secondary treatment and then full treatment.

Challenges

- Inundation of two out of four main power distribution centers.
- Inundation of all four minor power distribution centers.
- Numerous submersible pump motor failures.
- Moisture in non-submersible motors.
- Moisture in motor starters and VFD’s.
- No habitable operators quarters.
- No plant SCADA system.
- Silt, sludge, and debris throughout the site.

Initial Recovery Plan

- Dewater and clean site and buildings and remove moisture from equipment.
- Power portions of plant that did not flood.
- Install temporary power (using mobile generators and temporary wiring) for selected facilities to accomplish secondary treatment.
- Preserve MLSS in aeration basins by aeration.
- Complete integrity testing of electrical circuits and electrical and mechanical equipment required for secondary treatment.
- Remove and ship faulty motors and pumps to repair shop.
- Purchase low horsepower motors, motor starters, and VFD's required for secondary treatment.
- Rent and set up mobile unit for temporary operators quarters.
- Replace damaged electrical equipment and conductors.

Recovery Results

- Secondary treatment achieved 8 days after the flood event.
- Full treatment began 30 days after the flood event.
- No “treated effluent” NOV’s.
- Recovery still only 90% complete. (SCADA replacement pending and operator’s quarters are temporary.)

Major Surprises

- Very short period from storm event to flood crest.
- Height of river stage (1.5 ft. above Fran and Floyd events).
- Vulnerability of large stranded wire conductors.
- Vulnerability of solid state electronics and absence of willing outside resources to evaluate and repair electronics.
- Vulnerability of HVAC equipment.
- Detail and documentation for recovery expenses required by County's insurer and FEMA.
- Time required to get plant back to full capacity *with redundancy.*

Major Surprises

- Teamwork and collaboration of plant staff, utility managers, and contractors.
- Quick response, focused performance, and cooperation of contractors.
- Support and understanding of State regulators.
- Fast turn around for motor repairs.
- Availability of reconditioned, used electrical components *with a warranty*.
- Order of magnitude of “final” recovery cost.

Lessons Learned

- Do not locate a wwtp in a flood way or 100 year flood plain.
- Locate all electrical distribution equipment and especially all solid state components out of areas subject to risk.
- Recovery of pumps, blowers, drives, and non-solid state electrical components can be fast and relatively economical.
- Keep electrical and control system drawings current and consolidated into one set of as-builts.
- The most important resource to accomplish recovery is a team of individuals that trust and respect one another.
- How humbling an event of this magnitude makes one feel.

More Lessons Learned…

- Keep insurance policy updated and understand it!
- Maintain an up-to-date inventory of equipment.
- Establish an Document.
- Take pictures of everything before the event and throughout recovery.
- Document every discovery and decision.
- Consider ongoing emergency services agreements with contractors and engineers.

The Path Forward

- Finish recovery and achieve full process and equipment redundancy.
- Retain experts to predict future flood risk for the plant site.
- Negotiate with FEMA for non-insured recovery cost reimbursement.
- Complete an engineering study for mitigation.
- Negotiate with FEMA for mitigation funding.
- Build all future capacity additions on a new “higher” site, and develop a plan to abandon the current plant within 20 years.

Questions?