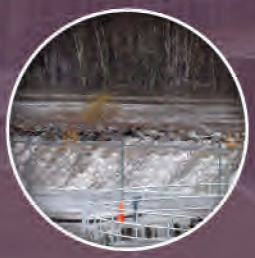
WOODARD &CURRAN

in association with: RPS asa

Implications of Climate Change for RI Wastewater Collection & Treatment Infrastructure



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EXECUTIVE SUMMARY

By their very nature, wastewater facilities are sited in flood prone areas. In Rhode Island, as elsewhere, increasing storm intensities have damaged wastewater treatment plants and pump stations. The state is home to nineteen major wastewater treatment facilities (WWTFs) that treat approximately 120 million gallons of wastewater per day. Because wastewater facilities and associated pump stations are located at low elevations, many are within riverine or coastal floodplains and are at risk to inundation and other natural hazards.

Recognizing that many necessary modifications to these systems would require long-term planning, the Rhode Island Department of Environmental Management (RIDEM) is working in collaboration with the state's Division of Planning and other agencies to integrate climate change considerations into wastewater system planning, as well as current operations. The first step towards this goal was to evaluate the implications of key natural hazards associated with climate change on the major wastewater infrastructure in the state. This report is the result of that initial effort.

The study included assessments of all nineteen treatment plants to identify vulnerabilities to flooding, storm surge, and other severe weather and climate change related impacts. The assessments were based on two types of data:

1. Predictive scientific investigations of the likely consequences of continued climate change in Rhode Island; and
2. Historic records of past events.

The predictive scientific investigations consisted of statewide assessments of coastal and riverine hazards and sea level rise, and local assessments of shoreline change and wave hazards in the vicinity of the vulnerable WWTFs. The results of the statewide assessments are available for use by the public. The coastal data is accessible through the STORMTOOLS web GIS at http://www.beachsamp.org/resources/stormtools/ and as well as through the Rhode Island Geographic Information System (RIGIS) at http://www.rigis.org/data/ScaledSLR_NACCS. The riverine data is available at http://www.rigis.org/data/ridem_RiverineFlooding. A RIDEM Mapper is also available with simplified access to the riverine and coastal change imaging that is used in this report: http://arcg.is/2mlL2bF. Climate change science is continuing to advance as new predictive tools and measures are being developed. The scope of this study was altered early on to take advantage of some new information that became available, but as the work progressed, it inevitably became necessary to use the data in place to progress to conclusion.

The historic data provided by WWTF operators and RIDEM are limited to recent events, the effects on the individual WWTF systems, and the extent they were recorded. Recorded information from the flooding experienced in March 2010 was a good example of extreme riverine flood hazards that was used to correlate the predictive results of the riverine hazard assessment. Historic records also proved useful to identify areas prone to localized flooding that were not captured on the statewide scale used for the riverine hazard assessment. Conversely, for numerous reasons, the historic records could not fully capture the effects from the major hurricanes experienced in the 20th century on wastewater infrastructure to allow a similar comparison to the theoretical extreme coastal storms assessed in this study. Most notable is that the severest coastal storms occurred prior to the existence of WWTFs and associated shoreline alterations, hardening, etc. Together, the historic and predictive data sources used in this study provide a basis for wastewater infrastructure resiliency planning.

Concurrently with the development of this report, the New England Interstate Water Pollution Control Commission (NEIWPCC) revised *TR-16, Guides for the Design of Wastewater Treatment Works in 2016* to address resiliency and adaptation standards for extreme storm events. Woodard & Curran met with representatives from RIDEM and the Coastal Resources Management Council (CRMC) to assimilate the information from this study and the TR-16 recommendations into design guidance for future WWTF upgrades. Two levels of resiliency were identified as targets for future upgrades:

1. Improvements that would provide for continuous operation up to a specified flood elevation, and
2. Improvements that would consider survivability of the structural and electrical components of the facilities up to a higher specified flood elevation.

The basis of the flood elevations (with or without some components of surge, wave action, and sea level rise) should consider the cost-benefit of the improvements.

This study provides each of the WWTFs with a simplified ranking of their systems for use in prioritizing repairs if multiple systems fail at any time. This tool could be particularly useful for the seven WWTFs that were predicted to become predominantly inundated under the hazard situations modeled. Coincidentally, NEIWPCC published a guide for wastewater managers in September 2016 entitled "Preparing for Extreme Weather at Wastewater Utilities: Strategies and Tips". This guide is an excellent source for facilities to use in conjunction with this report to update facility specific emergency management plans.

Adaptive strategies are suggested for each of the WWTF systems that were identified as being vulnerable. Consistent with the intent of this report to support planning efforts, the adaptive strategies are proposed to provide guidance for future system upgrades. They fall within one of five categories:

1. Hardening (e.g., constructing walls and dikes, flood-proofing);
2. Relocating (e.g., elevating or relocating equipment or systems);
3. Readily repairable or replaceable (e.g., standardizing equipment or stocking spare parts);
4. Redundancy (e.g., providing means to convey wastewater to two pump stations or using portable, temporary pumps); or as a last resort
5. Wet weather bypass (e.g., controlling flow to surface waters to avoid flooding public ways).

Estimated cost ranges were identified for each of the recommended adaptation strategies to assist communities with planning and budgeting for future improvements to their wastewater infrastructure. The majority of the suggested adaptation strategies fall into the category of hardening with corresponding implementation costs of under $50,000 each[1].

Finally, communicating the information within this report is important so it can be used in planning and policy development. Accordingly, customized briefs were prepared for each WWTF to summarize the climate change implications to that infrastructure. These are provided immediately following this executive summary.

[1] The cost of hardening projects varies significantly depending upon the scope; for instance, berm construction such as in Warwick or Bucklin Point would be much greater.