INFRASTRUCTURE IMPROVEMENT PLAN: ENERGY EFFICIENCY

Wastewater Treatment Facility

August 2019

Town of Warren, Rhode Island

A Plan for Energy Efficiency

BACKGROUND

Energy efficiency has been a pillar of the Town's plans for financial resilience and stability for many years. In 2011, the Town adopted a comprehensive Strategic Energy Plan. This plan has served as the Town's blueprint for progress. As a small town with only 10,611 residents, partnerships and collaboration are a vital part of every project. Since 2016, The Town of Warren has been a proud participant in the **Sustainable Wastewater Infrastructure of the Future (SWIFt)** program. This accelerator program has been led by the US Department of Energy through its Building Better Buildings initiative. The Town of Warren's wastewater facility is the only Rhode Island facility participating in the SWIFt program, and one of only seven facilities in New England. The Rhode Island Infrastructure Bank, as a signatory partner in the program, has facilitated Warren's participation and assisted in the data collection and analysis process.

Through a series of webinars and telephone conferences, SWIFf program managers have guided the Town of Warren through the process of self-assessment and goal setting. A "partners only" website has further informed this process by providing valuable tools and resources. The guiding principle for the Warren facility has been **resilience**, defined by DOE as an "approach [that] supports facilities aiming to enhance energy security by improving energy infrastructure to withstand extreme weather and climate change impacts".

The Wastewater Treatment Facility is currently undergoing a major upgrade project. The $21.7 million upgrade project addresses five primary needs:

1. Reducing the amount of nitrogen discharged into the Warren River, improving water quality
2. Making the treatment facility more energy efficient and reliable
3. Replacing old worn-out equipment
4. Improving safety for treatment facility operators
5. Making the facility more resilient to storms, flooding, and climate change

Financing for the current construction activities was provided through a voter-authorized general obligation bond, issued through the State's Clean Water Revolving Fund as administered through the RI Infrastructure Bank. Approximately $444,000 in principal forgiveness has been issued through the Environmental Protection Agency (EPA) to offset some of the costs associated with the inclusion of "green infrastructure" in the project improvements.

WARREN TEAM MEMBERS

The Town of Warren's Wastewater Treatment Facility is operated by Suez North America. Five Suez employees manage all day-to-day operations of the facility and consult as needed on improvements, permitting and process optimization. The Town's on-call wastewater engineering consultant and construction manager is Woodard & Curran. Value engineering services have been provided by the firm of Wright-Pierce. State regulatory agencies include the RI Department of Environmental Management (RIDEM) and the Coastal Resources Management Council (CRMC). Technical advisory services have been provided by the University of Rhode Island (URI). Key staff members within Town government include Director of Planning & Community Development Robert Rulli and Town Manager Kate Michaud.

GOALS

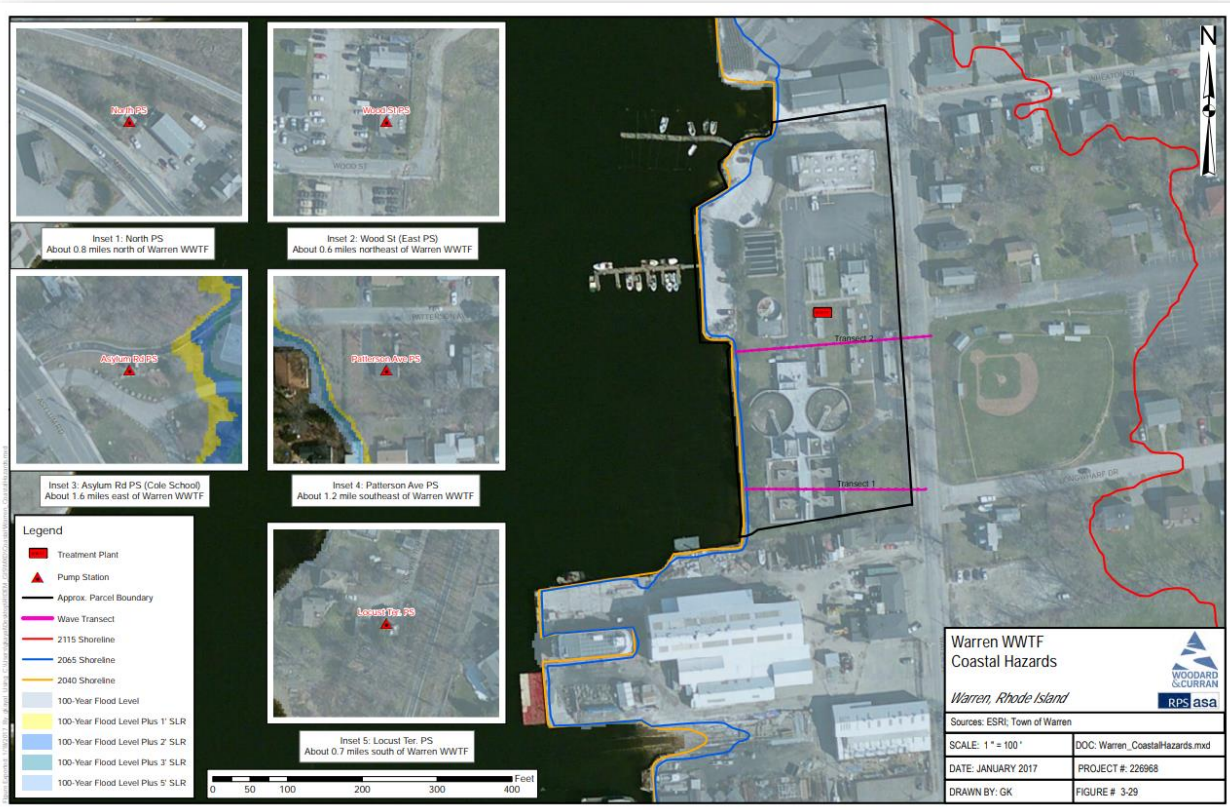
The SWIFf program has set out overall goals for partners, which is described as follows:

> *"State, regional, and local agencies are engaging water resource recovery facilities in their jurisdictions to accelerate a pathway towards sustainable wastewater infrastructure. Partners will seek to improve the energy efficiency of their participating water resource recovery facilities by at least 30 percent and integrate at least one resource recovery measure."*

For the purposes of this Plan, the timeline for improvements has been set at ten (10) years from the baseline year of 2016.

MOVING TOWARDS A RESILIENT FUTURE

Capital improvement planning must incorporate and mitigate risks as they are anticipated to exist over the life of the asset. For a coastal community such as Warren, these risks include sea level rise and increased precipitation. In 2017, the RI Department of Environmental Management, working with the Coastal Resources Management Council and the firms of Woodard & Curran and RPS, performed initial coastal flood risk assessments for all RI wastewater treatment facilities. The resulting report, titled "*Implications of Climate Change for RI Wastewater Collection & Treatment Infrastructure*[1]" served as the basis for infrastructure planning at the Warren facility.



Additional analysis was performed by the Town to determine the appropriate flood levels anticipated for the site in the year 2065, which is the assumed "end of life" for the current equipment upgrades. It was determined that the appropriate level was 16' above NAVD88, which represents the 100-year storm, plus three (3) feet of sea level rise plus wave action. Each critical component of the upgrade, including the generator, controls, switches, motors and other electrical equipment, was assessed. Through the assessment, it was determined that a combination of elevation and floodproofing measures would be utilized. A detailed memorandum documenting the analysis can be found as an appendix to this report. This methodology will be applied for future investments in facility infrastructure.

[1] http://www.dem.ri.gov/programs/water/wwtf/wwtf-climate.php

TOPICS OF ANALYSIS

Analysis of the future infrastructure needs of the Warren Wastewater Treatment Facility can be divided into several categories, including:

- Data Management,
- Measure Planning,
  - Technology Measures,
  - Management Approaches Measures,
  - Process Improvement Measures,
  - Resource Recovery Measures,
- Project Financing.

DATA ANALYSIS

Three primary points of data have been collected for the Facility for the years 2016, 2017 and 2018. These points include: electricity utilized, natural gas utilized, and gallons of flow treated.

Natural gas usage is minimal at the facility, so the main area of focus for improvement will be electric usage, especially as compared to the flow treated. Detailed information can be found as an appendix to this report, but can be summarized as follows:

YEAR	ELECTRIC USAGE	FLOW TREATED		
2016	918,300 kWh	546.81 MG	1,679.38 kw/MG	Baseline
2017	921,900 kWh	608.14 MG	1,515.93 kw/MG	
2018	1,020,300 kWh	822.53 MG	1,240.44 kw/MG	↓26.14%

It must be noted that a major upgrade of the Wastewater Treatment Facility broke ground in May 2018. Construction activities, as well as a major breach of a wastewater main in town, may have affected flow data for 2018. Overall progress over time will be a more important measure than single year changes.

MEASURE PLANNING

The ongoing facility upgrade will address several measures through the replacement of outdated or inefficient equipment. Other short-term improvements have been identified but are not included in the current scope of work. The short-term improvements can be considered “shovel ready”.

The timeline for implementation of short-term improvements is < 5 years.

Short-term measures include:

- New screening equipment at the headworks
- In-kind replacement of weirs, sludge pumping and collection equipment, and scum collection equipment at the primary pump station and primary settling tanks.
- New pumps at the intermediate pump station.
- Construction of new reactor tanks, equipment and modifications to the existing secondary reactor tanks to provide biological nitrogen removal (BNR).
- Upgrades to the secondary settling tank mechanisms, weirs and baffles.
- Replacement of the chlorine contact tank weirs; new instrumentation and a new sodium bisulfite feed system.
- In-kind replacement of the plant water system pumps.
- Improvements to sludge handling.
- Replacement of existing heating, ventilation, air conditioning, lighting and plumbing.
- New electrical service, transformer, emergency generator, switch gear and motor control centers.
- Upgrades and expansion of the instrumentation and control systems.
- Installation of photovoltaic panels on the existing operations building.
- Installation of a photovoltaic array off-site, designed to offset 80% of total municipal needs.
- Rate structure management to encourage conservation.
- Continued implementation of the plan to reduce Inflow and Infiltration (I/I) through replacement of aging system infrastructure such as manholes and pipes.
- Evaluation and upgrade of pump stations.

Other improvement measures have been identified but have not been fully scoped and vetted.

While there is the potential for these “long-term” improvements to move ahead in priority, currently the estimated timeline for implementation is 5-10 years.

Long-term measures include:

- Conversion to UV disinfection.[2]
- Onsite water reuse. (resource recovery measure)[2]
- Fleet conversion to electric vehicles.

Through the SWIFt program, several no- or low-cost measures have been identified for immediate implementation.

[2] See measure planning workbooks for more information.

No- and low-cost measures include:

- Use automatic controls when available to optimize equipment, process monitoring, and operations.
- Review operations to identify any pumps or blowers that are being throttled and assess them to determine if they can be adjusted to operate more efficiently.
- Test, calibrate, and maintain dissolved oxygen level/sensors in aeration tank(s).
- Utilize variable frequency drives during nightly low-flow periods or seasonal low-flow periods to reduce energy consumption.
- Reduce blower pressure to the minimum required through proper maintenance of aeration diffusers and distribution system to minimize head loss. Control the set point in the aeration blower control strategy. Also, identify, assess and repair aeration system air main leaks - (replace gasket, repair corrosion, underground maintenance) and lower aeration tank levels to reduce air header static pressure, if applicable. (May need sensing O2 level).
- Turn off equipment when not in use (e.g., turn off equipment periodically or operate intermittently).
- Adjust system operations when there is a change in wastewater load.
- Operate select aeration tanks as needed while also establishing operating protocols to enable the plant to bring tanks back on line efficiently.
- Idle aeration basins/zones, if not needed (periodic maintenance may still be needed).

PROJECT FINANCING

The primary source of project financing has been through general obligation bonds issued through the RI Clean Water State Revolving Fund, as administered by the RI Infrastructure Bank (RIIB). Through this program bonds are issued at a discounted rate saving taxpayer dollars and allowing for expanded scope. Additionally, RIIB has assisted the Town in obtaining principal forgiveness for green infrastructure aspects of our Wastewater Treatment Facility upgrades. Due to the high debt burden currently borne by the Warren taxpayers, it is doubtful that additional bonding will be an option in the immediate future.

The Town of Warren has participated in RIIB's Efficient Building Fund (EBF) for its Town Hall, Government Center and Community Center. This program provided a no-cost energy consultant to review existing usage and create a plan for efficiency upgrades. With rebates and incentives from the energy provider, National Grid, as well as the State's Office of Energy Resources, as well as low-cost financing, these projects are revenue neutral or revenue positive. This program is a potential future resource for efficiency projects within the Wastewater Treatment Facility operations building.

The Town of Warren has recently converted its wastewater operations financing from an ad-valorem tax on all property owners to a fee assessed to those connected to the public sewer system. (A separate fee is assessed to non-sewered properties to fund the pumping of septic systems, septic inspections, septage treatment at the WWTF and other regulatory requirements.) Capital expenses are currently shared by all taxpayers. Next steps include evaluating the potential to shift to a fee system based on usage. It is anticipated that this would encourage conservation and reduce wastewater flows. Logistical challenges exist, such as sewered properties serviced by unmetered private wells. The potential exists to create a capital fund to prepare for future expenditures on efficiency improvements.

The Town is participating in a new RI Office of Energy Resources Program, "Achieving Community Efficiency", which has its kickoff last month. Part of that process will be more refined goal setting and the hiring of a [shared] onsite energy manager. One of the first tasks for the energy manager will be to set up a system for benchmarking and to update the projects included in the Town's Strategic Energy Plan. Additional funding sources will be identified through this process.

The Town of Warren is one of five Rhode Island communities chosen to participate in the Municipal Resilience Program. This program, which will kick off in September, will gather community input to create a project list to increase the resilience of town and community facilities. Competitive grant opportunities will exist for participating communities.

Potential federal resources for future projects include USDA Rural Development Programs and the HUD funded Community Development Block Grant (CDBG) Program. In Rhode Island, non-entitlement communities must apply for CDBG funds through the State's Office of Housing and Community Development (OHCD). Recently, the OHCD has placed a strong emphasis on the creation and maintenance of affordable housing and has not funded any wastewater related projects.

APPENDIX A: Wastewater Flow Data 2016-2018

APPENDIX B: Electric Usage Detailed Analysis 2016 & 2017

APPENDIX C: Electric Usage 2018

APPENDIX D: Gas Usage 2018

APPENDIX E: Memorandum on Flood Resilience

UV & Onsite Water Reuse Workbooks Available Electronically