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Tanyard Brook

American Council of Engineering Companies
of Rhode Island (ACEC)

2023 Engineering Excellence Award

Project of the Year

BETA Engineering



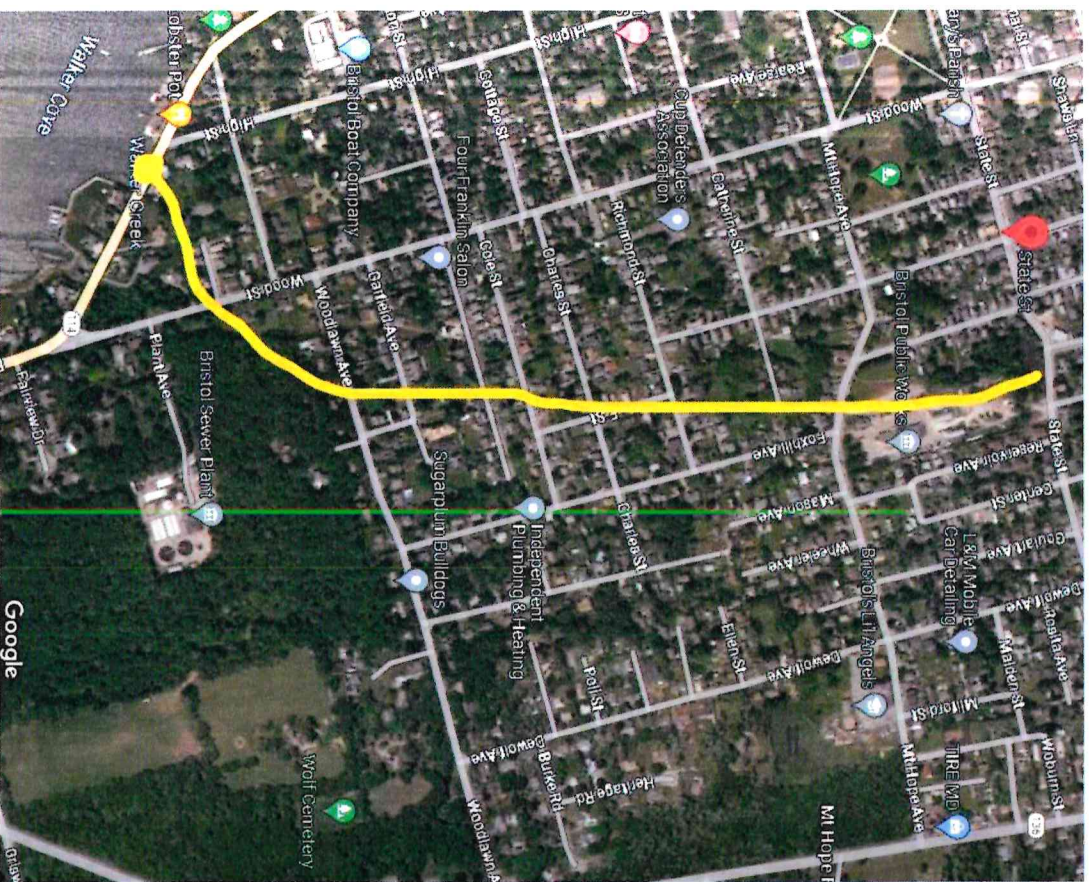
TOWN COUNCIL
DEC 06 2023
MEETING

Scope of work:

Reconstruct a 4,500 foot culvert starting at the State Street Reservoir, ending at the outfall at Walker Cove.

Challenge:

Project area meandered through residential neighborhoods, in private yards, between houses, and under garages and roadways.



Due to a number of causes – collapsed culvert, debris, and other blockage
- Tanyard Brook was unable to divert water during significant rain events,
creating overflow onto nearby properties.



With a cooperative effort among the Town, residents, BETA engineers, and construction contractors, the success of the project overcame even the most challenging scenarios such as:

- replacing the culvert alongside existing structures (top photo)
- maneuvering between existing foundations (bottom photo)



The new box culvert consists of rectangular concrete structures that allow free flow of water.

Once lowered into the excavated ditch, the sections are linked together to create a 'tunnel'.

The excavated area around the installed structures are backfilled and covered.



The culvert discharges via an aqueduct that extends from High Street to Hope Street across from the Water Pollution Control facility.

The ability for water to discharge at the outflow at Walker Cove is influenced by the tide.

During periods of high-tide, water rushes into the culvert, preventing outflow and adding to the flooding issues.

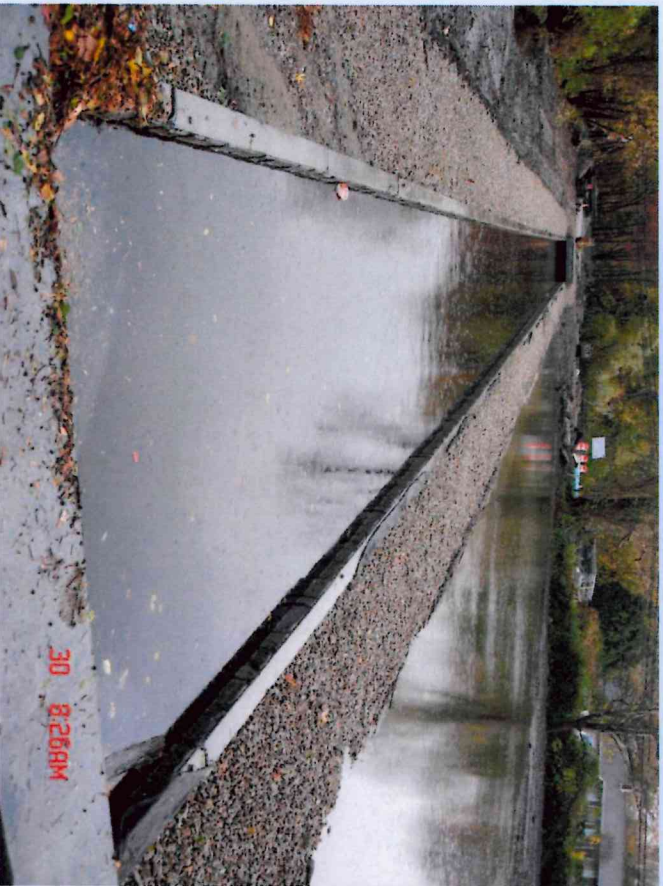
To mitigate the tidal influence, a tidal gate was installed at the outfall.

This feature blocks sea water from entering the culvert during high tides while allowing stormwater to exit into the bay.



The successful Tanyard Brook project is evident in residential neighborhoods where the impact of flooding is no longer detrimental to private and public property.

With the tidal gates in place and the unobstructed culvert channeling water to the bay, excessive water moves freely to the outfall.



Residents within the project area were left with improvements not only to the flooding issues, but also to the functionality and aesthetics of their property.

The end result is an improved stormwater management system and peace of mind for residents within the 500 acre Tanyard Brook watershed.



Congratulations!



**2023 Engineering Excellence Award
Project of the Year**



2023 ENGINEERING EXCELLENCE AWARDS

Tanyard Brook Culvert Replacement Project
Bristol, Rhode Island

Evaluation Criteria:

1. Successful fulfillment of the owner/client's needs.

The following objectives were established for this Project:

- Mitigate flooding issues impacting residential properties within the watershed;
- Replace failing open channel and piped sections of culvert from State Street Reservoir to Walker Cove;
- Increase the capacity of culvert/stream channel and make other related drainage system improvements;
- Minimize the disturbance to the 40 residential properties through which the Brook runs;
- Provide an effective and efficient design to optimize the use of construction funds; and
- Comply with CRMC, RIDEM and other state and federal regulatory requirements.



Residential property flooding caused by Tanyard Brook

The primary goal of the project was to intercept and convey the 10-year design storm within a culvert that could be constructed through residential properties with the least amount of disturbance.

Stormwater generated within the 500-acre watershed associated with Tanyard Brook is conveyed under existing conditions to the 4,500 foot long Tanyard Brook system. This system, located in the southwestern section of Town, extends from State Street Reservoir southerly to the outfall at Walker Cove. The existing alignment meanders through residential neighborhoods, through yards, between houses and under garages. The depth and width of the stream channel vary throughout its length. The stone-lined walls and earthen bottom were covered with concrete planks in the 1960s. Two segments of the conveyance system consisted of 60-inch corrugated metal pipe. The stone walls had collapsed in several locations, and there were numerous restrictions within the piped sections that reduced the capacity of the Brook, resulting in frequent flooding of roadways and neighboring properties. The outfall, shown to the right, is submerged during periods of high tide. While the Brook conveys runoff from the reservoir and the local street network, flow is restricted when the tide elevation is above the outfall pipe invert elevation.

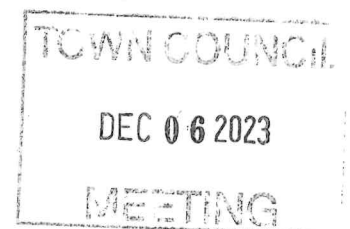


Tanyard Brook outfall at Walker Cove

The project was completed in three phases. The new culvert, which ranged in size from 3 feet deep x 8 feet wide to 4 feet deep x 9 feet wide, conveys the 10-year design storm. Each property owner along the alignment was given the opportunity to connect one or more yard drains within their parcel to the culvert. Flooding within the roadways and the residential properties has been mitigated as a result of the replacement of the culvert and the additional drainage improvements.

2. Social, economic or sustainable design considerations.

The 40 properties along Tanyard Brook have experienced chronic flooding resulting in damage and loss of property. The installation of the proposed culvert and associated closed drainage systems has mitigated these flooding issues. The Town was able to obtain funding for all three of the phases based on documentation of the chronic flood conditions. Funding sources included U.S. Department of Commerce Economic Development Administration (EDA), State of Rhode Island Community Development Block Grant (CDBG) Program, and the Coronavirus State and Local Fiscal Recovery Funds (SLFRF).



3. Uniqueness and/or innovative applications of new or existing techniques

The outfall of Tanyard Brook at Walker Cove is tidally influenced. Under existing conditions during high tide, the outfall is fully submerged and sea water enters Tanyard Brook. This exacerbates the flooding issues during significant storm events. This project included the installation of a tide gate at the outfall. Although this prevents seawater from entering the Brook, flow cannot discharge through the outfall when it is submerged. The segment of the Brook immediately upstream of the outfall, between Hope Street and Wood Street, is an open channel. Adjacent to this section of open channel is an area of green space owned by the Town. As part of the design, this area was graded and planted to allow flood storage should peak storm flow coincide with high tide and a submerged outfall condition. When this occurs, stormwater purposely overtops the open channel and flows into the "wetland area" until the tide and/or peak flow subsides and then the stormwater reenters the open channel and is discharged to Walker Cove through the outfall. This has promoted flood mitigation along Hope Street and Wood Street.

4. Value to the engineering profession and perception by the public

The Tanyard Brook project was a very high-profile project within the Town of Bristol. Chronic flooding and property damage was a well-known problem throughout the Town. Forty residences were directly impacted by the construction of the project, but all of the properties within the 500-acre watershed were beneficially affected by the results of the project. Before construction began, multiple public meetings took place to present the project and identify concerns from the public. In addition to the public meetings, there were meetings with each resident to obtain the easements and discuss private property restoration, scheduling, and overall expectations during construction. BETA's construction resident engineer was on-site throughout the project and was in constant contact with the residents.

The Town's commitment to restore and improve the condition of private properties impacted by the Project helped to ease concerns of the public. Once the residents realized the benefits of the project, skepticism and concern were replaced with positive collaboration.

5. Complexity

The project involved installing a large box culvert through private property and in close proximity to house foundations. This was done while maintaining and conveying stormwater flow generated in the 500-acre watershed. For example, there were only 12 feet between house foundations along Charles Street where the culvert had to be installed. The Town had to obtain 40 easements from the property owners before the project could begin. A collaborative effort with the Town, BETA, and the contractor was necessary to ensure that the residents were well informed of the major construction effort that would be occurring, literally in their backyards. Constant coordination with Bristol Water Pollution Control Division, Rhode Island Energy and Bristol County Water was necessary due to the number of utilities and service connections (sewer, gas and water) that needed to be relocated to facilitate construction.

