1.0 Introduction

This Section provides a summary of relevant background information and work completed in Phase 1 of the Combined Sewer Overflow (CSO) Control Plan for the Wellington Avenue CSO Treatment Facility, as well as the scope of work, objectives, and project approach for Phase 2.

The Wellington Avenue CSO Facility is located in a sensitive area adjacent to the Kings Park Beach which was designated as a Flagship Beach in 2003 by the Environmental Protection Agency (EPA) and Rhode Island Department of Environmental Management (RIDEM). Since this CSO is located in a sensitive area, the City is required to evaluate control alternatives to determine if the CSO can be eliminated. The City has undertaken a phased planning process to achieve this objective. The work performed in each of the Phases that have led up to the Phase 2 work presented in this document is described below.

1.1 Background

1.1.1 History

Construction of Newport's wastewater collection system dates back to the late 1800's and early 1900's. Though the system has undergone various improvements since that time, the system functioned as a fully combined sewer system until the 1970's, when the City undertook an extensive sewer separation program to reduce combined sewer overflows discharging into Newport Harbor. Under the 1970's sewer separation program, the existing public catch basins were disconnected from the combined sewer and reconnected to new separate storm drains. For the most part, the combined sewer was left in place to serve as the sanitary sewer, but roof leaders, sump pumps, basement drains, and area drains on private property were generally not disconnected. Flows from these sources continued to be discharged into the sanitary sewer system. In addition, the City constructed two CSO Treatment facilities. Due to utility conflicts, some catch basins remained connected to the sanitary sewer system due to utility conflicts or were outside of the areas where sewer separation was preformed. The Wellington Avenue CSO Treatment Facility was constructed in 1978 to screen and disinfect combined sewer overflows from the southern portion of the City. The Washington Street CSO Treatment Facility was constructed in 1991 to treat flows diverted from the Long Wharf Pump Station.

1.1.2 Summary of Administrative Consent Order

In 1999, a Consent Agreement was issued between the City of Newport and the Rhode Island Department of Environmental Management. The Agreement outlined effluent limitations and monitoring requirements for the Wellington Avenue Combined Sewer Overflow (CSO) treatment facility (Outfall 007A) as well as maximum daily total residual chlorine at the Water Pollution Control Plant (WPCP) (Outfall 001A). In addition, it established a timeline for submissions delineating a long term plan for control of CSOs. The parties agreed that the City should provide DEM with three technical memoranda that would provide a scope of work for a facilities plan update. Thereafter, a facilities plan update, which must contain characterization of the combined sewer system, CSO control alternatives, and the selected CSO controls, should be issued. With DEM approval, the City and its contracted associates would then design, construct, operate, and monitor the CSO abatement alternatives. An updated Consent Agreement is currently under negotiation.

Also in 1999, in response to the Consent Agreement (Administrative Consent Order or ACO), the City of Newport retained the services of Malcolm Pirnie to provide three technical memoranda. Technical Memorandum 1 was a Baseline Conditions Report. It described the design of Newport's collection system and CSO facilities. In addition, current CSO discharge permit requirements, designated receiving water uses, regulatory water quality standards and existing water quality studies were reviewed. Technical Memorandum 2 assessed the Washington Street CSO facility, including its operation and maintenance, wet weather collection system, and its performance between January 1996 and August 1999. Technical Memorandum 2 also described immediate CSO control improvements and operation recommendations that would improve the level of CSO event monitoring and control. Technical Memorandum 3 was the Wellington Avenue Treatment Facility Assessment. This Memorandum assessed the Wellington Avenue CSO Treatment Facility in a way that was similar to the way Technical Memorandum 2 assessed the Washington Street CSO Facility. It also investigated CSO reduction alternatives and recommended enhanced sewer separation prior to development of a long term control plan. Hence, the three memoranda assessed the existing collection system and CSO facilities and began to develop a way to bring Newport into compliance with DEM requirements. All of the work since 1999 has concentrated on implementing the recommendations included in Technical memorandum No. 3.

Technical Memorandum No. 3 included a description of the design and operation of the Wellington Avenue CSO Treatment Facility and tributary collection system, an evaluation of the frequency and duration of CSO activations, and recommendations for long term CSO control strategies for the facility. As was noted in the Technical Memorandum, the majority of the Wellington Avenue CSO Facility service area was separated, however, public connections from some catch basins to the sanitary sewer system and cross connections between the storm drain system and sanitary sewer system remained, as well as private connections to the sanitary sewer system from roof leaders, yard drains, basement drains, and sump pumps. Initial evaluations of the Wellington Avenue facility conducted as part of the Technical Memorandum recommended that a phased "enhanced sewer separation" alternative with infiltration and inflow reduction to maximize the extent of sewer separation in the tributary service area may be a more cost effective CSO control alternative than more capital-intensive and environmentally disruptive alternatives such as retention storage, detention and treatment storage, and outfall relocation. As noted previously, this work was proposed to be performed in phases which are described in more detail below.

1.2 Summary of Phase 1 Part 1, Phase 1 Part 2 and Phase 1 Part 3 CSO Control Plans

Recently, Earth Tech prepared the following reports and technical memoranda on Newport's sewer facilities:

- "Phase 1 Part 1 CSO Control Plan-Wellington Avenue CSO Facility," dated October 2006.

- "Phase 1 Part 2 CSO Control Plan-Wellington Avenue CSO Facility," dated January 2007, including the following Technical Memoranda:

    - Thames Street Interceptor Television Inspection
    - Flow Isolation and Follow Up Closed Circuit Television Inspection
    - Manhole Inspections
    - House to House Surveys

  - Smoke Testing
  - Dye Testing
  - Sewer Catchment Area 6 Flow Metering Investigation, and,
  - Hydraulic Modeling Software Selection.

- "Flow Optimization Study: Newport Water Pollution Control Plant," dated April 2007.

These documents are discussed in more detail below.

Phase 1 Part 1 of the CSO Control Plan included development of a preliminary flow metering program to prioritize catchments in the Wellington Avenue facility service area with the highest quantities of infiltration and inflow (I/I). In pursuit of this objective, existing data, such as sewer reports and separation plans, were reviewed. These documents included the following:

- Report to Hon. Mortimer A. Sullivan, Mayor Upon The Sewerage and Drainage of The City of Newport R.I., prepared by Metcalf & Eddy, September 25, 1928

- Report to The City of Newport, Rhode Island Upon Sewerage, Sewage Disposal and Drainage, prepared by Metcalf & Eddy, October 5, 1949

- Summary Report to the City of Newport, Rhode Island on A Program of Immediate and Long Range Improvements to Sewerage and Drainage Systems, Metcalf & Eddy, December 29, 1971

- Various Sewer Separation Contracts prepared by Keyes Associates, 1974-1979

- Report to the City of Newport on Recommended Sewerage Facilities for Newport Neck, prepared by Metcalf & Eddy, February 29, 1980

- Report to the City of Newport, Rhode Island on Combined Sewer Overflow Abatement Alternatives, prepared by Metcalf & Eddy, August, 1986

- Report on the Marine CSO Monitoring Program, prepared by Metcalf & Eddy, March, 1994

- City of Newport Rhode Island, Combined Sewer Overflow Technical Memorandum 1, Baseline Conditions Report, prepared by Malcolm Pirnie, August 31, 1999

- City of Newport Rhode Island, Combined Sewer Overflow Technical Memorandum 2, Washington Street CSO Treatment Facility Assessment, Prepared by Malcolm Pirnie, August 31, 1999

- City of Newport Rhode Island, Combined Sewer Overflow Technical Memorandum 3, Wellington Avenue CSO Facility Assessment, prepared by Malcolm Pirnie, August 31, 1999

Field work, including flow monitoring and physical surveys of interceptors, was performed. These activities generated data, which were assessed and evaluated in order to develop recommendations. Recommendations and conclusions from the Phase 1 Part 1 report included identification and prioritization of tributary catchments to the Wellington Avenue CSO facility with excessive infiltration (designated as Catchment Areas 3, 4 and 7) and inflow (designated as Catchment Areas 1, 3 and 4).

Additionally, a review of best management practices and nine minimum controls, a review of historical CSO data, and a review of CSO control alternatives was performed. Finally, a scope and budget for Phase 1 Part 2 of the CSO Control Plan was developed. For more detail, see the October 2006 report, "Phase 1 Part 1 CSO Control Plan-Wellington Avenue CSO Facility". The Phase 1 Part 1 CSO Control Plan report recommended the following actions:

- Develop a hydraulic model for the City's collection system,
- Perform a sewer system evaluation study (SSES) for the catchment areas identified as priority in the report,
- Perform a focused flow metering program to isolate flows generated in Catchment Area 6,
- Perform a CCTV inspection of the Thames Street Interceptor, and,
- Evaluate the flow contribution from Middletown's Wave Avenue Pump Station and provide data to RIDEM and Middletown so they may develop an appropriate program to reduce inflow and infiltration.

Phase 1 Part 2 of the CSO Control Plan for the Wellington Avenue service area included a Sewer System Evaluation Survey (SSES) in Priority Catchments 1, 3, 4 and 7 which involved manhole inspections, house to house inspections, smoke testing, dye testing, and closed circuit television inspections of sewers. Recommendations regarding the removal of inflow sources (such as roof drains, area drains, and sump pumps) were made. Figure 1.1 depicts the priority Catchment Areas for infiltration and inflow. A total of 28 public sources of infiltration were identified and evaluated for design issues and constraints on their repair. The City's GIS database was updated based on the data collected during the SSES. Flow metering, rainfall gauging, and tide gauging in Catchment Area 6 were performed, and various hydraulic/hydrologic models were evaluated for appropriateness in modeling Newport's sanitary sewer system. The DHI MOUSE/MIKEURBAN model was recommended. The evaluation of CSO activations at the Wellington Avenue CSO facility that was prepared for the Phase I Part 1 report was updated. The Phase 1 Part 2 Report recommended the following actions:

- Replace pipe identified in the flow isolation./CCTV inspection as having serious defects,
- Remove rain leaders, sump pumps and private drains from the sewer,
- Perform an SSES in Catchment Area 6 to identify extraneous flow sources,
- Disconnect catch basins from the sewer system and connect them to the storm drain system,
- Rehabilitate manholes identified in the manhole inspections as leaking or having the potential to leak via defects,
- Develop a hydraulic model to simulate existing and proposed conditions,
- Impose flow limits on Middletown to reduce flows to the Newport system, and
- Prepare the Phase 2 CSO Control Plan.

In December 2006, the Phase 1 Part 3 work was initiated. This phase included investigation of sources of I/I in Catchment Area 6; development of design plans to separate the 28 public sources of I/I (such as catch basins and cross connections); and development of rehabilitation design plans for 290 manholes that exhibited evidence of leakage, structural damage, or need of repair. For more detail regarding the Phase 1 Part 2 conclusions and recommendations and the Phase 1 Part 3 scope of work, consult the January 2007 report "Phase 1 Part 2 CSO Control Plan-Wellington Avenue CSO Facility".

1.3 Phase 2 CSO Control Plan Approach and Objectives

For this Phase 2 CSO Control Plan for the Wellington Avenue CSO Control Facility, a complete hydraulic model of the Wellington Avenue service area sanitary sewer system, and a limited model of the Washington Street service area, was developed using the DHI MOUSE/MIKEURBAN model. The modeling consisted of both a hydraulic model and hydrologic model. This model allowed for the understanding of the performance of CSO reduction alternatives in the context of the existing sewer system.

The hydrologic model was used to generate flows from tributary areas to the Wellington Avenue and Washington Street CSO Facilities based on single design storm events, such as the 1 year 6 hour storm required by RIDEM in its Combined Sewer Overflow Policy dated March, 1990, as well as larger design storms, such as the 2, 10, 25 and 100 year 24 hour storms. The model was calibrated using meter data collected between 2007 and 2008.

The hydraulic model simulated and modeled the pipe network tributary to the Wellington Avenue CSO Facility. It was based on system data regarding pipe size, depth, material, and connectivity information as well as flow metering. It was calibrated until the model network closely matched metered flows. A limited Washington Street model was also developed in order to evaluate the impact of various CSO control alternatives on the Washington Street CSO Facility, Water Pollution Control Plant (WPCP) and the Long Wharf Pump Station. Its setup was similar to the Wellington Avenue Hydraulic Model.

In addition to the modeling, design plans and specifications for high priority defects identified in flow isolation/CCTV investigations were developed. This Phase 2 CSO control plan report was developed with the following objectives:

- Summarize the results of a hydraulic analysis of existing and proposed conditions
- Recommend a CSO control plan for the Wellington Avenue CSO Facility based on the evaluation of CSO control alternatives
- Evaluate the impacts of recommendations for the Wellington Avenue CSO Treatment Facility on operation and performance of other key facilities such as the Washington Street CSO Treatment Facility, Long Warf Pump Station, and the WPCP
- Evaluate the impact of flows received from the Wave Avenue Pump Station in Middletown on the existing and proposed sanitary sewer system
- Estimate the costs of the recommended CSO control plan and perform an economic affordability analysis to determine cost impacts on ratepayers
- Propose a schedule for Phase 3 Design and Phase 4 Construction of the elements recommended in the CSO control plan

- Present the impact of removal of inflow and infiltration sources on combined sewer overflows as identified in Phase 1 Part 2 and Phase 1 Part 3 as well as recommend a post rehabilitation monitoring plan for the recommended Phase 3 design elements

1.4 Report Organization

This report is divided into ten sections organized as follows:

- The report begins with an Executive Summary which provides salient points in an abbreviated format.

- Section 1.0 serves as an introduction, providing relevant background, history, conclusions and recommendations of previous projects, and the scope of work and approach to the current project.

- Section 2.0 characterizes the existing system, including descriptions and evaluations of the sanitary sewer system, pump stations, storm drainage system, CSO facilities, and the Water Pollution Control Plant.

- Section 3.0 describes the recent system improvements and efforts at CSO management. This includes enhanced sewer separation projects and current best management practices.

- Section 4.0 summarizes the hydrologic and hydraulic modeling. The summary overviews the modeling approach, the modeled tributary areas in Newport, and the projected conditions from the model.

- Section 5.0 examines CSO abatement alternatives by giving an overview of current technologies and which technologies are most relevant to Newport.

- Section 6.0 builds on the previous section by describing how the alternatives were screened to provide recommended alternatives.

- Section 7.0 evaluates possible abatement alternatives in view of their actual impacts and requirements.

- Section 8.0 provides a cost analysis for the alternatives.

- Section 9.0 is a financial capability analysis. It helps to map which proposed projects are affordable and most in line with the City of Newport's financial capabilities.

- Section 10.0 presents the recommended plan for CSO abatement at the Wellington Avenue CSO Facility.