Optimatics
PLAN SMARTER

CASE STUDY: New York City DEP CSO Optimization Study, NY

Optimatics teamed with WCS, Hazen & Sawyer, and Mott McDonald to optimize the configuration of regulator structures in their combined sewer systems in order to reduce the frequency and severity of CSO events.

KEY POINTS

- Reduction of CSO Events, Especially in Lower-Magnitude Storm Events
- Avoid Large-Scale, High-Cost Upgrades such as Pipe Replacements Where Possible

CUSTOMER REFERENCE

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SYSTEM DESCRIPTION

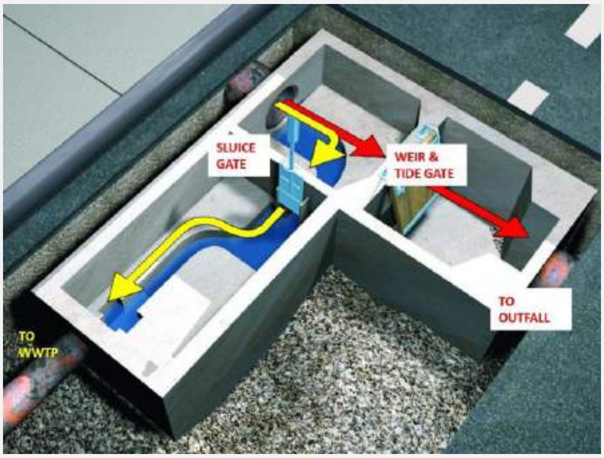
NYCDEP operates an extensive network of sewers, containing over 7,400 miles of pipe and 95 pump stations. Approximately 60% of the network is combined sewer, with the other 40% being sanitary only. Combined sewers operated by NYCDEP are designed to allow for combined sewer overflow (CSO) events to occur only when the flow into their receiving Wastewater Resource Recovery Facility (WRRF) exceeds two times the design's dry weather flow rate of the system. CSOs in the system are controlled by regulator structures which are comprised of a low-level orifice/sluice underflow to the WRRF and a high-level weir that discharges into local waterways.

PURPOSE

The purpose of this optimization effort was to determine optimal modifications to existing CSO regulator structures to reduce the frequency and severity of CSOs throughout the sewer system. Modifications investigated included raising and lowering overflow weirs and changing the size of the underflow to allow or disallow more flow to pass. Since changing a regulator configuration can influence upstream hydraulics, particular emphasis was put on ensuring that solutions would not increase the risk of basement backups or surcharge from upstream sewers.

PROJECT SCOPE

NYCDEP maintains calibrated Infoworks ICM hydraulic models for the sewersheds within their network. Each of these models was imported into the ICM integrated version of the Optimizer™ Decision Support Tool for Water Collection Systems for optimization.



The multi-objective optimization undertaken for each of the sewershed models focused on minimizing two objectives: **Capital Costs** and **Hydraulic Performance Deficiencies**.

A synthetics sequence of 5 different magnitude storm events was used for the optimization scenario, with a recovery period included between storms to allow the system to drain. This ensured any optimized strategies that reduced CSOs in lower magnitude storm would not have any adverse impacts in larger storm events.

The decision options used in the formulation mainly involved making modifications to the elements within existing regulator structures (see schematic above). Where possible, element changes were restricted such that they could fit within the existing footprint of the regulator structure and consequently minimize project costs.

The key design criteria used to measure the hydraulic performance in the system were number of CSO activations, volume of CSO discharge, and increase in pipe HGL level relative to existing conditions.

RESULTS

The optimization effort found that the scope for CSO reduction from regulator modification varied greatly from sewershed to sewershed. In some sewersheds, existing HGL and conveyance issues governed performance and only marginal reductions in CSO activations could be achieved. In many sewersheds, however, results found that regulator changes could reduce annual CSO activations by upward of 15%. The findings of the study were incorporated into Long Term Control Plans for the sewer system.