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Impact of Proper Maintenance of Combined Sewer Overflow System on Flooding in the City of Camden

Type of Project: Combined Sewer Overflow Solution
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Summary:

Modeling of Camden's combined sewer system (CSS) predicts the changes in the volume of stormwater conveyed to water pollution control facilities (WPCFs), combined-sewer overflows (CSOs), and flooding in the City of Camden as a result of cleaning pipelines and removing build-ups of silt and debris.

The model finds that the ability of the CSS to transmit flows to the WPCF and CSO outfalls is weakened by the sedimentation in the trunk and outfall sewers, driving increased community and street flooding due to CSS backups. The model predicts that 90 percent of the flooding problem could be eliminated in a normal year of rainfall by proper cleaning of the system. This demonstrates the importance of effective and consistent maintenance of the existing combined sewer system.

Background:

In order to reduce or eliminate associated flooding, CSO permittees need to reduce community and street flooding, ensure proper operation, maintenance and management of existing infrastructure and provide opportunities for green infrastructure.

The proper operation and maintenance of Camden's sewer system is an important component of its efforts to mitigate CSOs and flooding. The results are instructive for those seeking low-cost technology-based controls for reducing the magnitude and frequency of CSOs.

Results:

- When sewer pipe obstruction levels are reduced from 75 percent to 25 percent, flooding drops by over 90 percent.
- When pipe sediment increases from a 25-percent obstruction to a 75-percent obstruction, the annual volume of flooding increases from 18 million gallons to nearly 200 million gallons over the baseline.

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Methodology:

CDM Smith tested the system-wide impact of sedimentation in the trunk and outfall sewers on system performance. Three levels of obstruction were simulated using the long-term control plan (LTCP) model: 25 percent, 50 percent, and 75 percent of the pipe opening. The 75 percent level was selected to reflect actual conditions in some Camden CSS segments. The total annual volumes that are (1) captured by the WPCF, (2) overflow at CSO outfalls, and (3) discharged at flooded nodes in the model network were calculated for each scenario. The changes in each volume relative to the baseline clean-pipe scenario are also listed.

These scenarios were simulated by changing the pipe diameters of the trunk and outfall sewers to correspond to the effective conveyance (open cross-section) areas remaining after accounting for the hydraulic restriction resulting from sedimentation. The interceptor sewers and underflow pipes from each regulator were assumed to be clean; i.e., not constricted with sediment.

The model provides useful mass-balance insights but cannot address specific locations or conditions such as flooding caused by clogged catch basins or flooding in sewers upstream of the limited model network in the combined sewer system.

Data:

	Volume of Stormwater Discharged to (MGY)*			
	Baseline (clean pipe)	**25% sediment**	**50% sediment**	**75% sediment**
WPCF	20,394	20,390	20,383	20,361
CSO	887	876	848	759
Flooding	37	55	96	235

*The total volume discharged from the system increases slightly due to reduced in-system storage volume available at the end of the simulation as sedimentation increases.

	Change Compared to Baseline in Volume of Stormwater Discharged to (MGY)		
	25% sediment	**50% sediment**	**75% sediment**
WPCF	-3	-11 (-.1%)	-33 (-1%)
CSO	-11	-39 (-1%)	-128 (-14%)
Flooding	18	59 (49%)	198 (435%)

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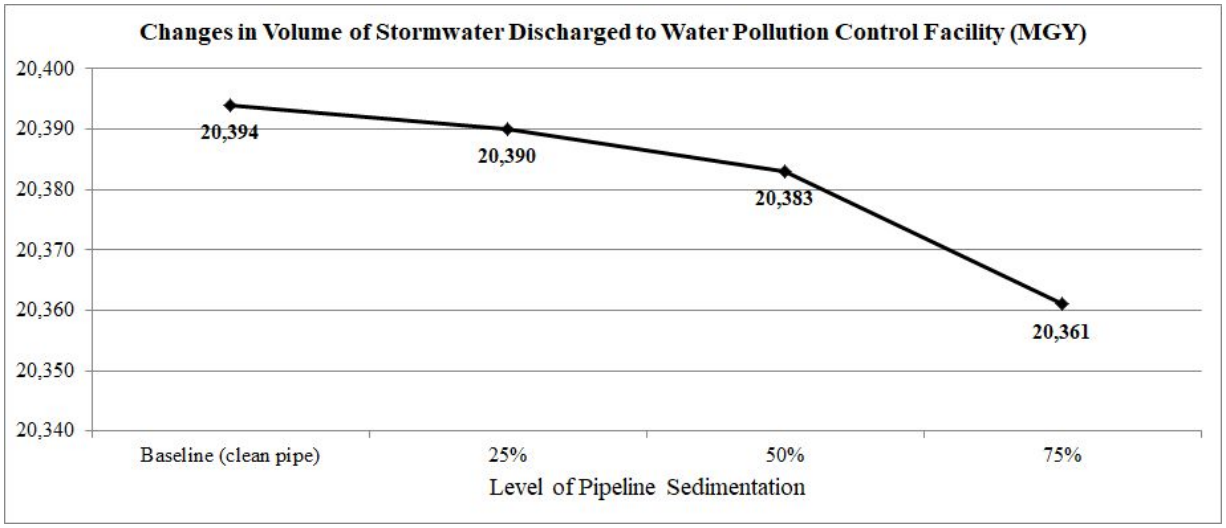

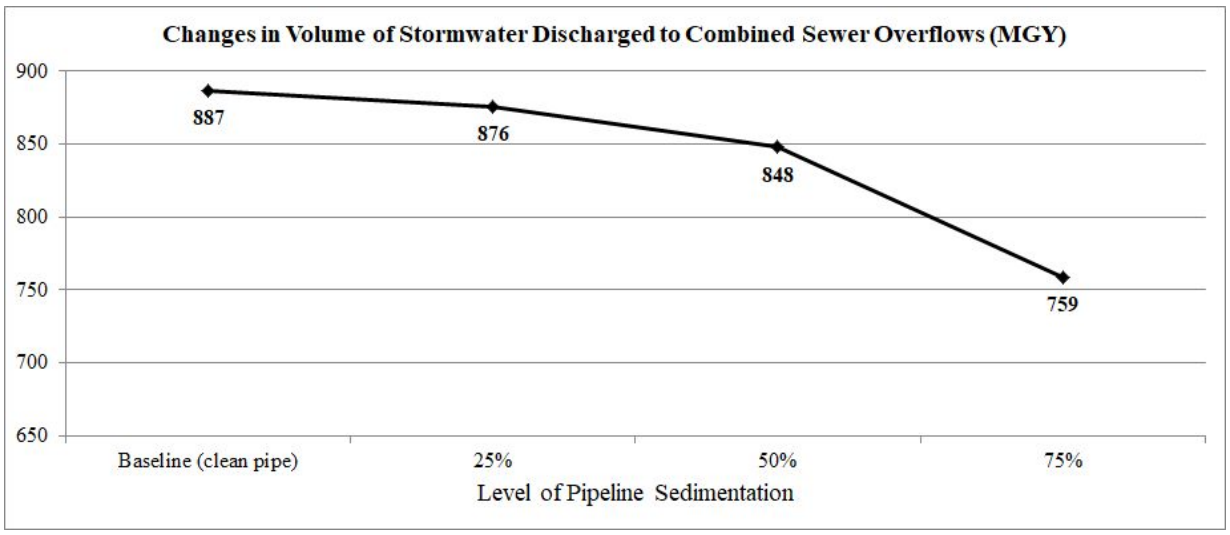

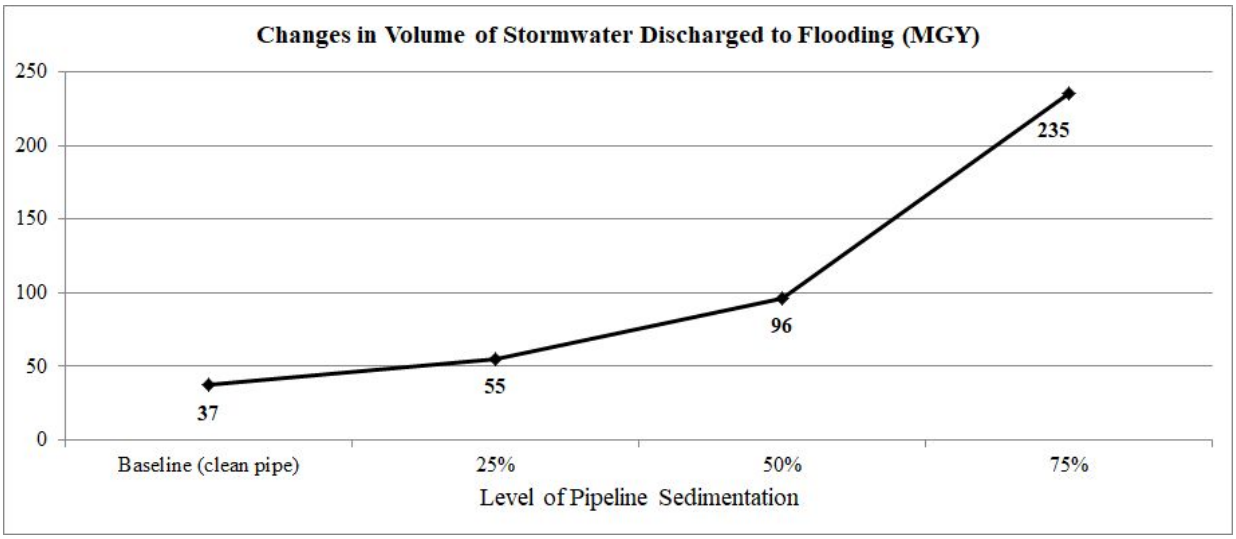

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