CITY OF SOMERVILLE, MASSACHUSETTS
DEPARTMENT of ENGINEERING
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BOARD ORDER #203947 - ELMWOOD FLOODING ENGINEER'S REPORT

On 13 July 2017, the Board of Alderman approved the following agenda item:

SUMMARY

Order
#203947

By Ald. Ballantyne
That the Director of Engineering inspect the 41 Elmwood Street area for continual water and sewage flooding when severe rain storms occur.

COMPLETE TEXT

That the Director of Engineering inspect the area of 41 Elmwood Street for continual water and raw sewage flooding problems when severe rain storms occur.

SPONSORED BY: Ward Seven Alderman Ballantyne

RESULT

RESULT: **APPROVED**
FOLLOWUP: Public Utilities and Public Works Committee

Background

Elmwood Street is a public right-of-way to the south of Holland Street. It has not been paved by the city in the past 5 years, and it is not on the city's 5-year paving plan; however, that plan is revised annually based on pavement condition survey. Elmwood Street is served by an 8" water main. A 30" brick combined sewer constructed in 1879 that serves a large area to the south of Teele Square crosses between 25 and 21 Elmwood from Cameron Avenue and flow north to Holland Street. Sanitary and normal storm flows from that area, including 21 to 5 Elmwood, are conveyed southward on Holland Street and ultimately to the Somerville Avenue Combined system. During large storm events, the Holland Street subsystem overflows to the Tannery Brook system. Sanitary and storm flows from the southern end of Elmwood Street are directly connected to the Tannery Brook system. An 8" sanitary sewer constructed in 1896 starts at 29 Elmwood and flows south. In 1919, a 12" storm drain was constructed over and sharing manholes with the sanitary sewer starting at 44 Elmwood and flowing south. Both of those pipes connect to the Tannery Brook system.

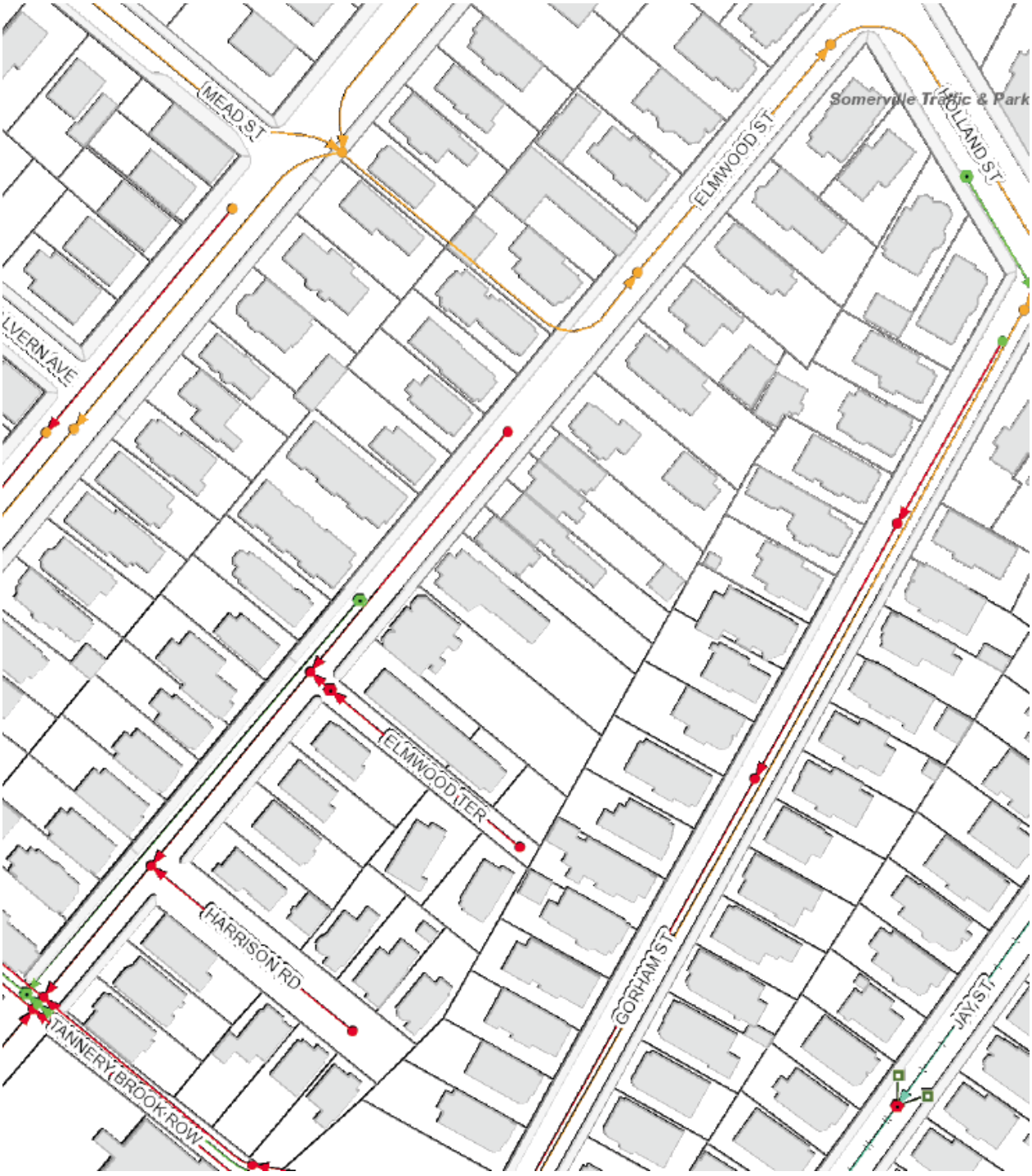

Figure 1Area Infrastructure

Site Investigations

In July and August 2017, the Engineering Department and Sewer Department conducted several investigations on Elmwood Street. Prior to the investigations and following reports of flooding and sewer back-ups, the Sewer Department cleaned the catch basins and all of the area pipes to ensure that the system was free from any blockages.

The roadway is generally in good condition, and localized flooding due to roadway grading is not evident. There are catch basins in the public right of way at Elmwood Street's intersections with Holland Street, Elmwood Terrace, and Tannery Brook Row. Catch basins also exist on private property for the condo complex at 39-41 Elmwood / 40 Cameron.

Figure 2 Catch Basin near Elmwood Terrace

Figure 3 Private Subsystem for 39-41 Elmwood / 40 Cameron Condo

Dye testing in the area between 39 and 51 Elmwood Street confirmed that system connectivity is correct. The sanitary service for 47 Elmwood is connected to the deeper sanitary system. The public catch basins near Elmwood Terrace are connected to the shallower drain system. The common manhole near Elmwood Terrace; however, can create cross-communication between the two systems during surcharge conditions.

Figure 4 Sanitary in Common Manhole

Figure 5 Stormwater in Common Manhole

At the manhole at the intersection of Harrison Road, the storm drain line is hard-piped through the manhole eliminating the potential for cross-communication. However, that piping arrangement limits the hydraulic capacity of the sanitary sewer. Despite the Sewer Department's efforts to clean the system, a clearly defined channel for sanitary flow is lacking. Dye testing confirmed the connectivity of Harrison Road, but flow moves slowly. There is also evidence that the system surcharges regularly, which is consistent with reported problems along this region of the Tannery Brook system.

Figure 6 Obstructed Flow near Harrison Road

At the Elmwood Street system's connection to the Tannery Brook interceptor, dye tests again confirmed that the 12" Elmwood drain and the 8" Elmwood sanitary sewer are connected to the appropriate portions of Tannery Brook system. However, those connections are in a common manhole; therefore surcharging of either system can create cross-communication between the systems. Moreover, this condition is present at many locations along the Tannery Brook system, so despite locally separate systems, all pipes act as combined sewers during large storm events.

Figure 7 Sanitary Connection to Tannery Brook System

Figure 8 Storm Connection to Tannery Brook System

Conclusion

The cleaning and dye testing of the Elmwood Street subsystem confirm that the system is handling flows as intended. However, back-ups reported by constituents, particularly the recently constructed sub-grade units at the 39-41 Elmwood / 40 Cameron condo complex indicate that the cross-connections between the sewer and drain pipes can cause problems consistent with those of a combined sewer system. Weather patterns during the summer of 2017 that included several short-duration, high-intensity storms resulted in several such problems for localized subsystems such as the Elmwood Street subsystem. According to 311 reports and other complaints investigated by the Engineering Department during the summer of 2017, those problems are particularly acute in low-lying areas tributary to the Tannery Brook system.

Catch basins do exist on Elmwood at the proper low points. As is the case at many locations throughout Somerville, it is possible that the inlet capacity of those catch basins becomes overwhelmed during high-intensity storms. However, before the effectiveness of additional catch basins can be evaluated, we must first understand the capacity of the subsurface pipe network. Moreover, increasing the street drainage capacity could exacerbate the sewer system back-ups for constituents with below-grade plumbing.

Recommendation

The problems reported on Elmwood Street, Meacham Road near Buena Vista Road, Howard Street, and other locations are all symptomatic of larger issues with the Tannery Brook system. Furthermore, the extreme weather conditions during the summer of 2017 resulted in thirteen (13) Combined Sewer Overflow activations from the Somerville system to the Alewife Brook. By means of comparison, that CSO is expected to activate only three times per year. It is reasonable to expect the federal Environmental Protection Agency and Massachusetts Department of Environmental Protection will require Somerville to implement corrective action under the requirements of our CSO permit. The goal of reducing CSO volumes may be at odds with the goal of moving water more quickly through our system and away from neighborhoods to reduce flooding and sewer back-ups. Therefore, it is imperative that Somerville immediately initiates its planning, and defines a program that achieves its dual goals before a plan is mandated by the regulators that exclusively reduces CSOs to the detriment of Somerville constituents.

The Engineering Department has commenced the first step in that effort. The planning for Union Square infrastructure improvements has relied extensively on a refined hydraulic model of the combined sewer system that allows evaluation of alternatives to optimize designs on both the macro and micro levels. To solve the flooding problems along the Tannery Brook corridor while also reducing CSOs, the city needs that same capability. To that end, under a prior sewer capital improvement appropriation issued by the Board, we will begin the refinement of the hydraulic model for the remaining areas of the city outside of Union Square. The model build will include metering of the sewer, and will be partially dependent upon capturing data during a range of storms. Therefore, it is likely that this effort will take up to a year to complete.

While the model will be critical to the completion of Tannery Brook planning efforts and the recommendation of action plans, there are other efforts that can begin in tandem with the model build. The Engineering Department will scope a planning effort to define that planning project similar to the Union Square Flood Reduction Alternatives Project and more recent efforts to plan the next phases of work upstream of Union Square that leverage the Somerville Avenue and Poplar Street Stormwater Pump Station projects. Similarly, the Engineering Department will scope a planning effort to develop a policy for stormwater management on private property. Once those projects are defined, a request for funding will be brought to the Board.

In the meantime, Engineering Department discourages below-grade plumbing, and encourages use of backflow preventers on any plumbing fixtures that are below ground elevation. It is important to note that backflow preventers are not placed on the sewer lateral. Backflow preventers must be placed on the internal plumbing branch to which any below grade plumbing fixtures connect. We place that condition on any permit reviewed by Engineering and are doing our best to get the message out to the community in general.