



Department of Public Works | 860.584.6125

MEMORANDUM

DATE: September 7, 2021

TO: Mayor Ellen Zoppo-Sassu
Board of Public Works

FROM: Raymond A. Rogozinski, P.E., Director of Public Works

RE: City Flooding / Drainage Issues

The City has experienced a number of large storm events over the summer. Specifically, the City received heavy rains on: July 19 (4 inches), August 19 (approx. 4.5 inches of rain within 1 hr.), August 29 (Tropical Storm Henri 5.5 inches of rain) and September 2 (Tropical Storm Ida 7 inches of rain). Storm Henri did not impact Bristol severely, therefore the following correspondence is focused on the events of July 19, August 19 and September 2.

Flooding is a function of both the quantity (number of inches of rain) and the intensity / rate of rainfall. The storm events of July 19 and August 19 were short-duration, high-intensity events which resulted in the flooding of localized areas where City drainage did not have sufficient capacity to receive or convey storm flows. In contrast, the flooding on September 2 was a function of our major rivers, such as Pequabuck and Coppermine Brook, exceeding their capacity which resulted in direct flooding and water backing up into the City storm drainage system.

As engineers, we often speak of and describe storms in terms of year's frequency of an event. We refer to storms as 100, 50, 25 and 10 year storms. In the State of Connecticut that equates to 7.98, 7.05, 6.20, and 5.05 inches of rainfall. However, it is important to understand that storm event years equate to inches of rainfall over a 24 hour period. Since the intensity of rainfall matters, the 4.5 inches of rainfall on August 19, 2021, over a 1-hour period can create more flooding than a 100-year storm, which is defined as 7.98 inches of rainfall over a 24-hour period. It is also important to understand what a 100, 50, 25 and 10 year storm actually means. A 100-year storm does not mean that it will only occur once every 100 years, rather it means that there is a 1 percent chance that Connecticut will experience 7.98 inches of rain during a 24-hour period EACH year. Likewise, a 50-year storm equates to a 2 percent chance each year, and 25 & 10-year storms equates to a 4 & 10 percent chances respectively, EACH year. It should also be noted, in accordance with City Ordinance 21-119, roadway storm drainage is sized for a 25-year storm event. A number of the City's existing drainage systems predate the ordinance and are much



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smaller. The DOT design drainage manual requires State storm drainage systems to be designed for 10-year storms with culverts sized for a 50- & 100-year storms, depending on the size of the drainage area.

Many residents incorrectly believe that the City owns all the rivers, streams and wetlands located in the City. Through the City's network of roads, drainage easements and City property, we do own a portion of them. However, they are generally owned by private property owners as defined by the property description delineated in their deeds. If there is a stream in the back yard of a property in Bristol, it is generally on private property and the responsibility of the property owner to maintain. That said, work in areas of streams and wetlands does require a permit from the City's Inland Wetland Commission, as designated by the CT DEEP.

When the DPW receives a drainage or flooding complaint, the standard procedure is to contact the property owner to obtain additional information, perform a field inspection, and review available mapping of the area. If the problem is associated with City storm drainage, our first step is to jet and clean the storm lines to ensure that the drainage system is operating as designed. If the problem persists, we video the storm drainage system to confirm there is no blockage. If the problem is due to lack of catch basins on a road within existing storm drainage, we typically add catch basins or storm drainage piping. Resolving storm drainage issues becomes more problematic when there is either no existing storm drainage in the area, a drain pipe is undersized for a long length of roadway, or the receiving stream or waterbody has insufficient capacity to accept the City discharge during storm events. In these cases, formulating a capital project and obtaining BOF appropriation is required. Between procuring funding, developing a design, obtaining environmental permits and bidding, a capital project typically takes 2-3 years prior to the start of construction.

One of the most common storm drainage complaints in the City is roadway storm water entering private property from driveway aprons. The City standard is to have a 1.5 inch lip where the driveway meets the edge of the road. It also requires the entire driveway apron (portion 4 ft. closest to road) to be higher than the road which results in the back of apron being 4 inch higher than the road. In order to prevent road runoff from entering the driveways, DPW often replaces driveway aprons to establish a lip.

A summary of the identified flooding areas which have occurred over the summer is provided below. Please note, they are not in priority or severity of flooding order. In addition, the summary is a preliminary assessment. DPW is still receiving reports, therefore the list may not be complete.



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It may be updated as additional information is obtained and additional engineering analysis is performed.

1. Brace Avenue; Portion of Brace Avenue (south side) from Vera road to Cabot Street: water jumping the curb. They experienced flooding on the July 19 and August 29 storm events (high intensity). DPW jetted and cleaned the storm drainage system. Problem persists. DPW provided sandbags to contain water within roadway. DPW scheduled to confirm piping configuration in area of 106 Brace Ave. The catch basin is adequate. Appears section of storm drainage piping is undersized. Engineering evaluation/capital project may be required to upgrade system to stream west of Vine Road.
2. Vine road / Duncan Street intersection: Standing water /flooding of intersection due to backup/capacity of receiving stream west of Vine Road. DPW to inspect stream located west of Vine Road to Stafford Ave to ensure there are no blockages.
3. Beth Avenue/Hiltbrand Road intersection: Standing water flooding of intersection due to piping in intersection and capacity of receiving stream. DPW jetted / cleaned lines in intersection. DPW will video inspect drainage piping and evaluate pipe sizing.
4. Carolina Road: Area of 65 & 75 Carolina Road experiencing flooding from water entering their property from the road. The garages are lower than the road, therefore water enter the basement. The problem is that there is a large amount of water runoff from the rear of the property located on the east side of Carolina Road that is bypassing storm drainage systems and overloading the City storm drainage which results in water exiting the roadway. DPW has cleaned and jetted the storm drainage system. The problem persist. Grading east of Carolina is difficult to access due to private fencing. DPW recommends a neighborhood meeting to obtain access to rear yards to evaluate grading/drainage. Potential capital improvement project required.
5. Clark Avenue: Approximately 400 ft. north of Terryville Road (Route 72) water from private property (Ross Auto Parts) is eroding the embanking resulting in sediment & runoff entering Clark Avenue. DPW has notified the property owner and as of this writing the property owner has initiated corrective action. If the problem is not resolved, DPW will issue enforcements fines until corrective action is completed.



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6. Balsam Road: DPW has been contacted by property owner indicated that the City storm drainage is clogged. DPW cleaned and jetting the drainage system, however the property owner indicates that the problem persists. DPW expanded the area of storm drainage cleaned to include the interconnection to Hemlock Street and Hemlock Street to Pine Street. In addition, WPC is scheduled to assist DPW with videoing the storm line to confirm that there is no blockage.
7. Hardwick Road: Area of ponding flooding at the intersection of Hardwick Road and Meadowbrook Drive along with the rear of the properties located on the north side of Harwick Road. Both issues are related to the backup of the stream that flows toward Brook Street. DPW will jet & clean the storm drainage system, remove sediment from the Brook Street culvert and inspect the stream for blockages that flows from Brook Street to the Coppermine Brook north of Artisan Street.
8. Louisiana Avenue: The area of Louisiana Avenue at the intersection with John Avenue experienced standing water. The bridge did not overtop. The ponding is a result of City storm drainage at the John Avenue intersection backing up when the water surface of the Coppermine Brook rises and submerges the City outfall. The issue is not pipe capacity of the City's system it is function of the low elevation of the Louisiana Avenue & John Avenue intersection. Correction would require raising the elevation of the intersection that is not practical due to the impact to private property. It should be noted that the City storm drain on the east side of the bridge is also submerged, however the area does not flood due to the higher elevation of the area and storm drain catch basin grates. Louisiana Avenue storm drains have been replaced and the road is scheduled to be paved this September.
9. Trout Brook Road/ Sheffield Road: The intersection of Sheffield Road and Trout Brook Road floods due to the high water surface elevation of the Coppermine Brook. City storm drainage currently discharges directly into the Coppermine Brook and backs up with the Coppermine Brook floods. The City storm drainage previously discharged into a drainage channel that runs in the rear of Trout Brook Road property. The referenced channel has not been maintained by DPW, however DPW will contact property owner to arrange to clear the channel to provide a degree of storage.
10. Frederick Street Bridge: The area initially flooded during tropical storm Ida due to the Pequabuck River overtopping in the area between Andrew Street and the Frederick Bridge. The bridge did not overtop, the area west of the bridge is the low point of the roadway and



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experienced flooding. It has been reported by a property owner that the berm upstream of the bridge overtopped and flooded private property. DPW has provided regular maintenance of the area on the bridge to ensure flow during storm events. The existing debris will be removed along with the sediment under the bridge (Inland Wetland permit required to remove sediment). The property owner did request assistance from the City to pump water out from behind the berm. The City did perform a similar task approximately 16 year ago when the berm broke, however since the area is private property and the berm was not breached City resources were not deployed. A potential project to provide future assistance to the property owner would consist of installing a manually operated drain pipe across the berm that would enable the area to be drained without the use of a pump.

11. 125 East Road: The property of 125 East Road is accessed via a driveway that crosses a large culvert. The downstream headwall of the culvert has failed and will continue to deteriorate. The approximate cost of replacement is \$80,000-110,000. DPW is coordinating with the City's Building Department, Corporation Counsel and ECD to provide assistance to the property owner, however to date the means to facilitate corrective action/assistance is unclear.
12. George Street: In the rear of the properties in the area of 44 George Street a stone walled concrete bottom channel (approx. 5 ft. x 5 ft.) has/is failing. A garage constructed over the channel has been condemned. Repairs are required throughout the channel, therefore corrective repairs performed by a single property owner may not result in a long term sustained solution. Unrepaired upstream sections of the channel may result in water from above flowing behind downstream channel section causing failure. A review of property records indicate no City easements in the area, the drainage channel in question is private. DPW has scheduled a meeting with a consultant engineer to review evaluate conceptual design solutions. Ultimately any long term solution will require work on multiple properties. Although it is important for DPW not to provide false expectations to residents by implying that the City will perform corrective action or fund work on private property, there is a potential role the City can provide by facilitating a resolution among the multiple property owners. DPW will continue to coordinate action with the Building Department and the City's Corporation Counsel.
13. Litchfield road: The road was paved in 2020 and as a result multiply driveway were impacted (lost driveway lip). Water runoff from the City road is entering driveways. DPW has replaced three driveway aprons. The driveway apron at 44 Litchfield Road requires



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additional work that will be performed the week of September 12. In order to prevent runoff into the referred driveway DPW has provided sandbags. The driveway at 33 Litchfield Rd is also receiving runoff. Due to the low slope (flatness) of the existing driveway the enter driveway is being replaced to obtain positive flow (\$2,200).

14. Divinity Street: The culvert located east of Peck Lane overtopped and eroded the downstream property (316 Divinity Street). The culvert is currently in the design phase of a project to replace the culvert. The erosion occurred on private property and is not the type of repairs performed by DPW. The property owner has obtained an estimate of \$10,500 from the same contractor that performs City storm drainage work Tabacco & Sons. In order for DPW to proceed with the culvert replacement project an easement from the property owner on the impacted area is required, therefore consideration should be made to cover repair cost subject to acquisition of an drainage easement.
15. Broad Street/ Todd Street intersection: The area of the Broad Street / Todd Street intersection floods. The flooding occurs when City storm drainage backs up due to a high water surface elevation of the Pequabuck River. Since the catch basin grate elevations on Crowley Auto are lower than the Todd Street storm drainage water exist the City's system and flows into Crowley / Broad Street and the Pequabuck River (as water recedes).
16. Middle Street / Riverside Ave: The intersection of Riverside Avenue and Middle Street flooded. It is a state roadway and DPW is currently contact the State to obtain additional information and potential DOT corrective action.
17. King Street / Page Park Road & Bristol Eastern entrance: King Street is a State Road and is not maintained by the DPW, however flooding occurs due to the capacity of the downstream culvert and stream that crosses Bristol Eastern. DPW will inspect the stream from Bristol Eastern to Carpenter Ave/ Stonecrest Drive & West Washington for blockages, however the depth of the King Street roadway flooding can be reduced if the area on Bristol Eastern is excavated/lowered behind the sidewalk approximately 12 inches. Lower the grade behind the sidewalk will result in flooding of the adjacent athletic fields but is critical to maintaining vehicle passage along King Street. The roadway is currently unpassable and as the Route 6 closes due to flooding the closing of this section of King St effectively prevent a detour from Route 6 to route 72.



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18. Royal Drive / Chippanee Golf Course: Properties along the north side of Royal Drive receive runoff from Chippanee Golf Course (10th hole). Chippanee has performed corrective work in the area, replacing approx. 300 lf of piping & installed sandbags along Royal Drive. Although the referenced action has been performed additional work is required to prevent the runoff. The golf course area continue to drain to the pond area south of the 10th green and there appears to be insufficient capacity of the drainage system/piping to convey required flow to the pond located on the 11th hole. An engineering evaluation by Chippanee is required to confirm determine and size system. The IWC has contact Chippanee and has schedule a special wetland meeting on 9/15/21 to address the issue. DPW is coordinating with Building Department (Property Maintenance Ordinance) and Corporation Counsel to pursue corrective action.
19. Chippenwood Lane / Chippanee Golf Course: The properties at the eastern end of Chippenwood Lane receive runoff from Chippanee Golf Course. The drainage channel that discharges from the 11th hole pond runs along the eastern properties of Chippenwood Lane properties. The drainage channel in area has silted in and appears to have insufficient capacity to convey flow to the north. As a result storm water jumps the channel and flows into the Chippenwood lane properties. The drainage channel is on Chippanee property and corrective action would appear to consist of removing sediments/ excavating channel to provide original capacity. An engineering evaluation by Chippanee is required to confirm determine and size channel. The IWC has contact Chippanee and has schedule a special wetland meeting on 9/15/21 to address the issue. DPW is coordinating with Building Department (Property Maintenance Ordinance) and Corporation Counsel to pursue corrective action.
20. East Main Street: The north side of East Main Street from Lincoln Avenue to the town line flooded. The Pequabuck River overflowed and resulted in 28 residents being evacuated. DPW is scheduling a meeting with Police, Fire and Emergency Management to obtain additional information and coordinate resources for future events.
21. James Street: The culvert at the end of James Street was blocked during the August 19 storm by debris. The stream jumped the river embankment, crossed James Street flooded three James Street properties before the flow returned to the stream. DPW cleared the debris and cleaned the road. The culvert pipe section are metal corrugated and sections have failed. The property owner has made repairs. DPW will continue to monitor.



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22. Stonecrest Drive: The area of Stonecrest Drive adjacent to Sheriden Woods flooded due to the capacity of the downstream channel. DPW Engineering will inspect the area from Stonecrest to West Washington for blockages and DPW Street Division is scheduled to remove sediment in the area of the culvert.
23. Lake Avenue Culvert: The property owner of 706 Lake Avenue contacted DPW indicating that the condition of culvert has resulted in damage to his property. Based on a preliminary evaluation the property of 706 Lake Ave is approx. 100 ft. upstream of the City culvert and it appears water will overtop the culvert prior to backing up on the subject property. However the property owner is experiencing extensive flooding. The stream located on the property of 706 Lake Ave has silted up in areas and water jumps the stream around a bend upgrade of the house. As a result it appears water from the stream flow between the house and the garage during large flows. The flow erodes portions of the subject property and appears to flow into Lake Avenue where it enters the City storm drainage system (does not cross Lake Ave). The stream is on private property and requires an Engineer to evaluate capacity and corrective action, however the property owner has stated that he does not have the financial means to take corrective action. In addition the potential damage to the private property there is also a potential of damage to Lake Ave due to the redirected stream. DPW will be coordinating with the City's Building Department, Corporation Counsel and ECD to provide assistance to the property owner, however to date the means to facilitate corrective action/assistance is unclear.
24. DPW landfill: An area of DPW's landfill along the northern section adjacent to Covanta eroded during the 9/2/21 storm. A section of the liner is exposed. A project to repair the erosion in areas throughout the landfill is currently being designed by the engineering firm of Fuss and O'Neil Inc. They will advised DPW on the proposed recommended corrective action.
25. Glenn Street: The southern gutter of Glenn Street was eroded. DPW will be repairing the roadway (filling with surge stone), however additional investigation is required to control up gradient water flow. The water eroding Glenn Street is bypassing the stream that discharges to 706 Lake Ave.
26. Battle Street: Multiple properties on Battle Street south of Hill Street access their property via drainage culverts. The culverts are private. A number of the culverts eroded during the



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9/2/21 storm. It appears that property owners are making repairs and DPW has not been contacted regarding this issue.

27. Minor St: The gravel portion of Minor Street adjacent to Richie's ice cream eroded along the northern gutter line. DPW is regrading the road and is scheduled to pave the roadway section with funding obtained from the solar farm.
28. Mix St: The area of Mix Street / Farmington Avenue and Coventry flooded during the 9/2/21 storm. Farmington Ave was closed to traffic. Flooding was a result of the high water surface elevation of the Coppermine Brook. The area of Coventry and Tolland flooded, not as a result of City piping having insufficient capacity rather flooding occurred due to the low elevation of the area (water back upped from the Coppermine Brook). This section of river was the focus of the Coppermine Brook study prepared by MMI. They investigated several project to improve conditions such as the creation of upstream detention area, removal of the private bridge at Harbor Freight and channel improvements along the river upstream of Farmington Avenue, however none of the project were determined to be feasible and effective in reducing flooding.
29. 595 King Street: The referenced property is receiving runoff from Page Park. There is an up gradient drainage channel that run along the western property lines of the Marilyn Drive houses and crosses the old ski slope. The flow through the swale was shorts circuiting and a portion of the runoff flows towards the property of 595 King Street. Based on an on-site meeting, the Park Department will perform repairs to the existing swale/piping system to facilitate diversion of runoff across the old sky slope. However, the northern end of Marilyn Drive and the down gradient area between the swale and the 595 King Street will flow to the property. The option of installing an addition diversion channel closer to the King St property does not appear viable due to the grade south of play scape, need to remove trees and the need to direct additional water to the State's drainage system. One potential option is to fill the existing swale that directs flow to 595 King Street, however that would require work within an existing tree area that will limit use of equipment.
30. Jerome Avenue: The home at 396 Jerome Avenue (in floodplain) immediately south of Willow Brook Road experiences regular flooding into structure. The City is investigating options to assist the homeowner.



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31. Hopmeadow Road: 199 Hopmeadow Road experienced rising stream waters. DPW will investigate downstream culvert condition for maintenance.
32. Perkins Street: Property owners at 135 Perkins Street and 120 Perkins Street (west and east of the street culvert) complained about excessive water, high stream velocities and erosion. The City has inspected the properties and culvert, as well as the upstream pond system.
33. Sonstrom Road: The property owner at 280 Sonstrom Road indicated there was flooding in the rear lot. A private system traversing the neighbor's rear lot to the City's catch basin has not been maintained. The City's storm drain system appears to be draining properly.
34. Burlington Avenue: The property owner at 1192 Burlington Avenue (two lots north of Shrub Road on the east side of the state road) is looking for assistance for storm relief. DPW will investigate whether there is information on possible storm drain connection/state referral option.
35. 67 Gregory Place: Property owner is experiencing erosion in rear lot/possible blockage of pipe. Property owner has been granted approval for stream erosion improvements. Downstream culvert may need maintenance. PW to investigate maintenance responsibility of pipe, as the rear lot stream is privately maintained.

The summary provided above does not include the names of property owners, however each flooding issue has impacted residents. Although we speak of storm frequency and flooding events occurring once every 3-5 years, I have noticed over my 20-plus years with the City the emotional impact that flooding has on property owners. In addition to the work they are required to perform cleaning up after a storm they also experience a degree of stress each time it rains, not knowing if it will result in flooding. That said, although DPW can address multiply projects at one time, as Director it is important that Department resources are allocated to maximize public benefit. Therefore, flooding is addressed along the following priorities:

1. Flooding of public infrastructure/roadways entering private property (homes/buildings)
2. Flooding of private property entering/impacting public infrastructure/roadways
3. Flooding of private property impacting multiply private properties
4. Flooding of private property impacting single property

Please feel free to contact me with any question at 860-584-6113.