

Memo

To: Veronique Blanchard, Town Administrator, Town of Conway

From: Megan Rhodes, FRCOG Livability Program Manager
Ryan Clary, Senior GIS Specialist

Date: October 30, 2023

Re: Upper Baptist Hill Rd, Pine Hill Rd, Baptist Hill Rd Drainage Assessment

Summary

On September 15th, the FRCOG received a request from the Town Administrator of the Town of Conway for technical assistance regarding drainage issues in the neighborhood of Pine Hill Road related to the recent flooding of many homes during the summer. In the month of July 2023, the Town of Conway received over 20 inches of rain. There was significant flooding in this neighborhood during two particular severe rain events that were only separated by four days. The Town had limited information on where or how the neighborhood's stormwater drainage was functioning.

In general, the terrain in this study area is quite steep. Water draining from Pine Hill must pass through this neighborhood downhill to Route 116 and the South River. The land north and west of Pine Hill and Upper Baptist Hill Road is extremely steep with an average slope of 20% with a mix of open grassland and forest. This

Figure 1. Pine Hill Neighborhood (near Conway Center)



steep terrain causes the velocity of stormwater to be very high once it gets to this neighborhood.

On September 27th, FRCOG staff conducted a field assessment of the problematic area (see Figure 1). The following is a summary of the assessment and staff findings with detailed findings and pictures beginning on the next page. A map of the study area and drainage structures can be found at the end of this report.

Overall, FRCOG staff found only 16 drainage structures in the study area. Not only is this an insufficient number for the size of the drainage area and terrain, but many of the structures are also not sized large enough. There are also gaps in connecting drainage structures causing storm water to rapidly flow over the land rather than being channeled through culverts and drop inlets. In addition, there are locations in which culvert pipes and/or junction boxes are suspected to be crushed or non-existent. A GIS analysis using LiDAR data¹ and “right sizing”² calculations found that many of the culverts are not large enough to accommodate the water flowing from the sub-watersheds in the area. The FRCOG also conducted a GIS analysis showing estimated drainage areas for stormwater to help determine where stormwater would most likely flow during heavy rain events (see map).

The FRCOG staff had previously conducted a culvert inventory and assessment of all drainage structures in the Town of Conway in July 2020 and it does not appear that any structures’ conditions have noticeably changed since that time (Note: FRCOG staff did not conduct an engineering level assessment).

¹ LiDAR data is very detailed elevation data used in GIS to depict the ground surface.

² FRCOG staff have developed a Drainage Culvert Right-Sizing methodology to assess the proper size of a drainage culvert based on the water flowing to that point.

Findings (maps located at the end of this document)

Upper Baptist Hill Road

There are three segments on this road in which stormwater is collected and then diverted off the road to drain downhill towards Route 116 over residential properties. Not only is this not enough drainage to handle the volume of water that is coming from Pine Hill located above it, the existing pipes are also undersized. Because many homeowners on the south side of Upper Baptist Hill Road and below that on Route 116 experienced flooding this summer, it is recommended that the drainage be increased and connected along the length of Upper Baptist Hill Road so that it captures the stormwater and directs it towards the end of the street and intersection of Pine Hill Road, rather than intermittently letting it flow down the hill towards Route 116. The existing drainage segments could be used for overflow during times of heavy rainfall.

Pine Hill Road and Upper Baptist Hill Road

The FRCOG conducted a GIS analysis to determine the size of the drainage area for culvert #1 on Pine Hill Road. The analysis showed that the watershed for this culvert is estimated at 10 acres, (see Figure 2) which requires a drainage pipe much larger than the current 16 inch culvert that is currently there.

Figure 2. Estimated drainage area for culvert #3 on Pine Hill Road



During the site visit, FRCOG staff identified two natural depression at culverts #1 and #3 which fill with water very quickly after the existing small pipes are overwhelmed with the quantity of

storm drainage. The water then floods over both Pine Hill and Upper Baptist Roads and then flows down Baptist Hill Road. These natural depressions could be used as detention basins to hold and slow down stormwater during rain events if they were enlarged.

There is a junction box located just past the traffic island at Pine Hill Road and Upper Baptist Hill Road (#4 on map) in which three pipes come together (1 buried and not visible – see Figure 3). FRCOG staff believe that the stormwater that is flowing from the traffic island through culvert #3 should be draining to this junction box and then flowing through a pipe to Baptist Hill Road. However, that pipe could not be located and is suspected to be crushed as town DPW have tried to unclog it without success. This junction box also has an overflow pipe to culvert #5, but because the outlet to Baptist Hill Road is buried and suspected crushed, all of the water instead flows to #5, which is undersized to accommodate the water volume causing more flooding at this intersection.

Figure 3. Culvert 4 (junction box)



Baptist Hill Road

From the intersection with Upper Baptist Hill Road, stormwater flows down Baptist Hill Road and is captured by three inlets. However, the drainage structures seem to end halfway down Baptist Hill Road at the drop inlet #15. It is not clear if there is an outlet there or where the stormwater then flows. There is a very small undersized pipe at #16 encased in asphalt (see Figure 4). There is also no evidence of any drainage structures on the connecting Emerson Hollow Road, which means that additional stormwater is flowing to Baptist Hill Road for only a few, small structures to handle that are easily overwhelmed during heavy rain events.

Figure 4. Culvert 16 (inlet)



FRCOG's GIS analysis showed that much of the drainage in this area leads through the property located at the bottom of Baptist Hill Road and intersection with Route 116 (12 River Street). At this property, FRCOG staff found a clay pipe behind the house that seemingly drains directly from the north between Baptist Hill and Upper Baptist Hill Roads, but the inlet could not be located. Alongside this pipe was a second 12 inch clay inlet pipe that drains to Route 116 (see Figure 5 and 6).

Figure 5. Two clay pipes at address 12 River Street



GIS analysis shows that the drainage area of the unknown pipe at 12 River Street is approximately 24 acres. A drainage area of this size should have pipe with a minimum size of approximately 20 inches. (see Fig 7).

Figure 6. Area of unknown culvert pipe

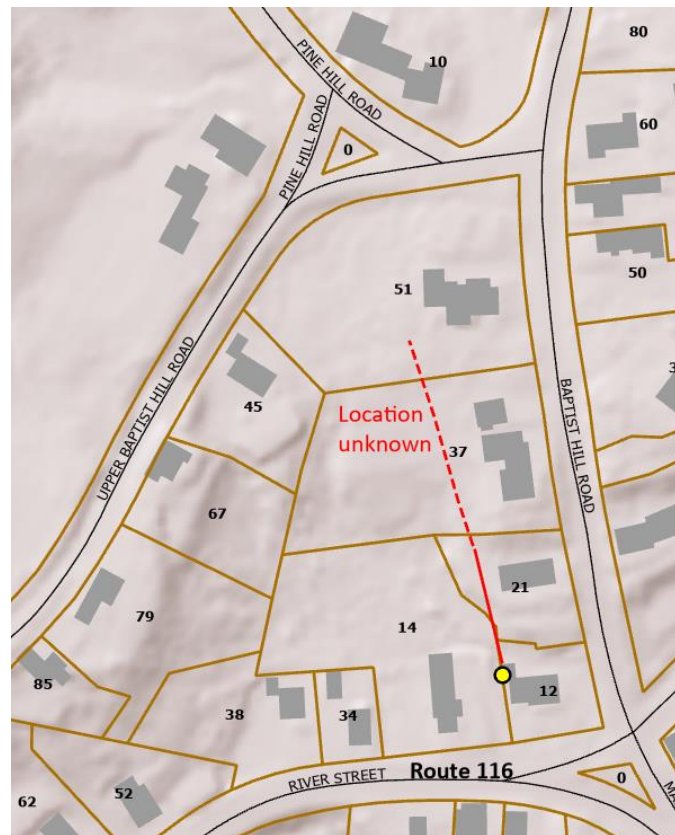
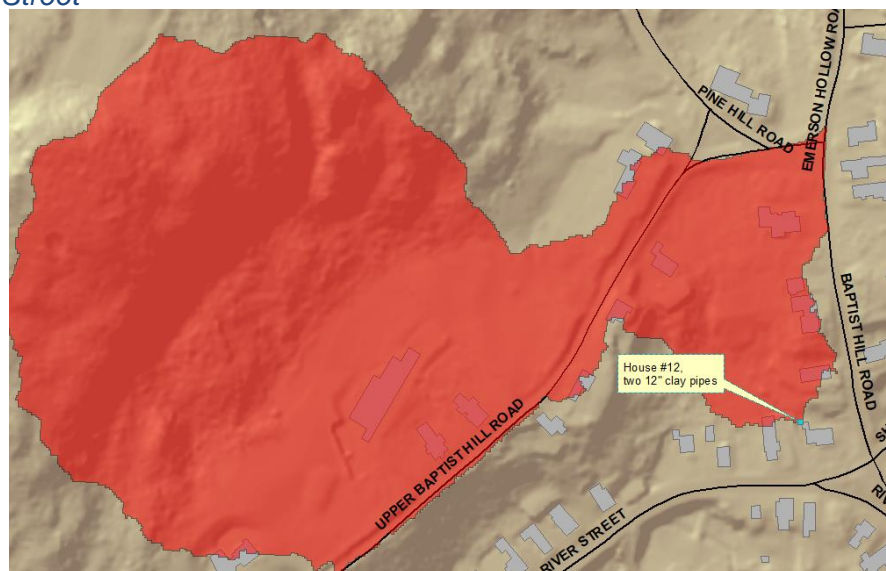


Figure 7. Drainage area of culvert found at house located at 12 River Street



Conceptual Planning Recommendations

With the steep terrain and lack of proper drainage, this area will be prone to flooding again during heavy rain events. There are immediate improvements that the Town can undertake relatively easily and there are others that will require planning, engineering, and more significant funding. Fortunately, Upper Baptist Hill Road is slated to be reconstructed soon, which provides an opportunity to install improved stormwater management along this roadway. The suggested improvements below are conceptual ones based on a surface-level site assessment and GIS analysis. It is recommended that an engineer be contracted to conduct a hydraulic survey to determine the exact sizing and routing of the drainage structures.

Immediate Measures Needed:

- Contract with MassDOT to have a dye test completed to determine where the water is draining in this neighborhood and how the pipes are interconnected
 - Use dye test to investigate if there is an outlet to the drop inlet #15
 - Use dye test to determine the location of the inlet for the clay pipe at 12 River Street
- Clean out junction box #4 and find where pipe #4 drains to and if it is indeed crushed
- Dig the area around the inlet to culvert #1 deeper and wider to create a detention area (storage) for heavy rains with property owner permission
- Dig a larger detention pond in the traffic island at culvert #3 to store water off of Pine Hill Road

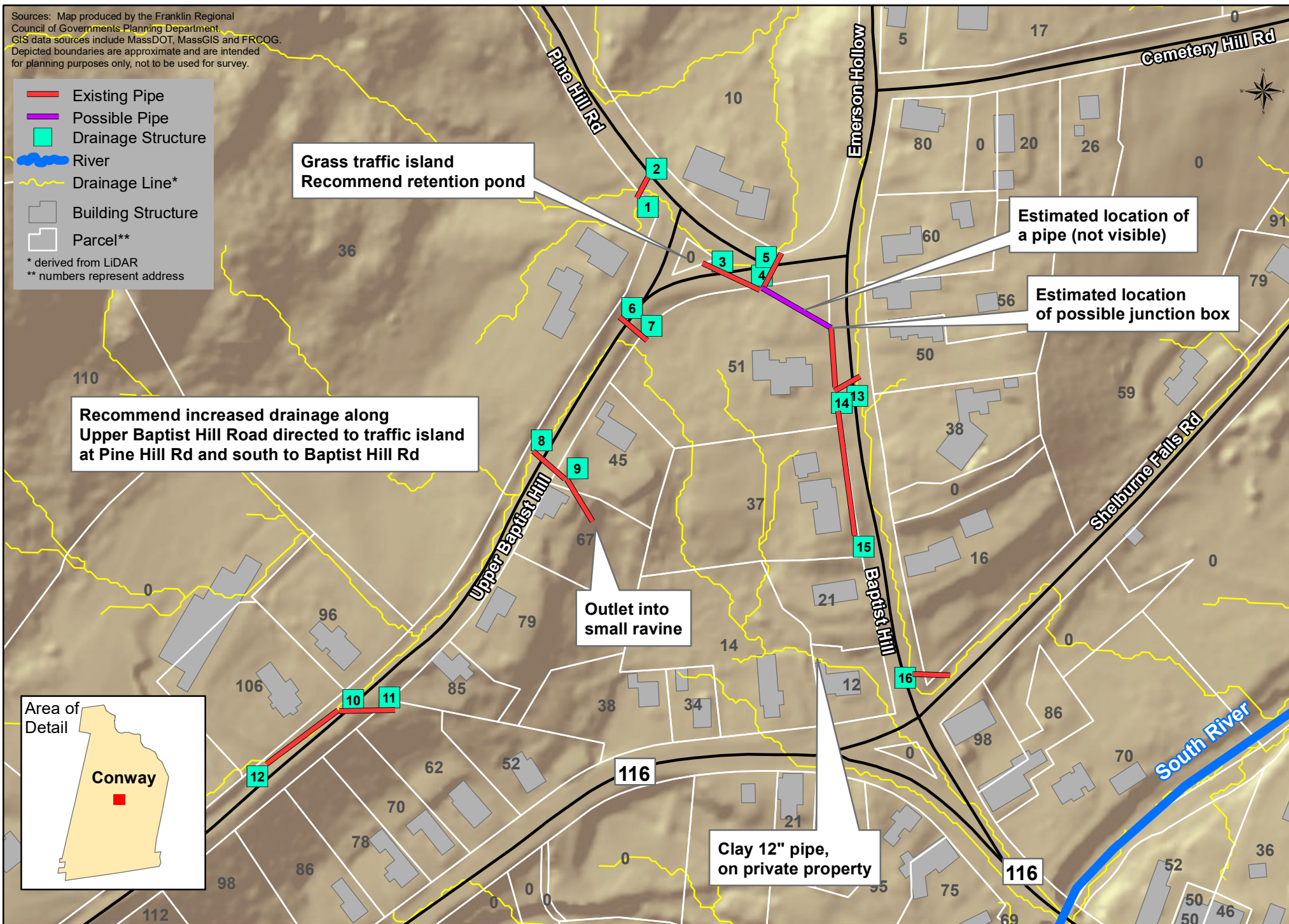
Intermediate and Longer Term Measures Needed:

- Increase the size of culvert #1 to a minimum of 20" and realign it so that water flows more easily into it
- Replace culvert pipe from #3 to #4 with a minimum 20" pipe
- Add additional drainage structures along Upper Baptist Hill Road traveling north to capture more stormwater runoff. The structures should be located on the northwest side of the road and connected all the way to #3 detention pond so as to not drain into private property on the south side of the street. The intent is to capture the stormwater flowing from the steep terrain of Pine Hill beginning at culvert #12 on Upper Baptist Hill Road all the way to culvert #3. Then, transport the stormwater down Baptist Hill Road and into the Route 116 stormwater system and the South River.
- Replace #4 junction box to a concrete box designed to handle the flow from Upper Baptist Hill Road
- Replace pipe from #4 to Baptist Hill Road
- Add additional drainage structures along Emerson Hollow Road to Baptist Hill Road
- If #15 is not adequately draining to Route 116, connect #15 to #16 and replace #16 to a larger size pipe.

Sources: Map produced by the Franklin Regional Council of Governments Planning Department. GIS data sources include MassDOT, MassGIS and FRCOG. Depicted boundaries are approximate and are intended for planning purposes only, not to be used for survey.

- Existing Pipe
- Possible Pipe
- Drainage Structure
- ~~~~~ River
- ~~~~~ Drainage Line*
- Building Structure
- Parcel**

* derived from LiDAR
 ** numbers represent address



Existing Stormwater Drainage Infrastructure Assessment Pine Hill Road Neighborhood, Conway MA

October, 2023

0 100 200 400
 Feet

Number	Description	Notes
1	16" round plastic inlet	flows under Pine Hill to #2
2	16" round plastic outlet	flows behind house #10 and down hill
3	12" round metal inlet	at the southeast corner of traffic island flows under Upper Baptist to #4
4	junction box with wood lid 4'x3'	critical box has 3 12" clay pipes, flows to #5 and towards Baptist Hill (suspected crushed) to another possible junction box
5	12" round metal outlet	suspect this is an overflow for #4 but is acting as main pipe and flooding house #10 yard and basement
6	12" round plastic inlet	flows under Upper Baptist Hill into #7 into yard of house #51
7	12" round plastic outlet	outlet from #6
8	drainage grate	inlet flows under Upper Baptist Hill to #9 (junction box)
9	junction box (concrete)	this junction box has a round concrete lid with an inlet pipe from #8 and an outlet plastic pipe that goes underground about 50 ft to a small ravine to the southeast
10	drainage grate	has 12" inlet pipe from #12 and a pipe going under Upper Baptist Hill to #11
11	junction box	junction box has a round concrete lid which is partially open, not sure where the water goes from here, guessing towards RT 116
12	drainage grate	has a 12" plastic pipe running underground parallel to Upper Baptist Hill to #10
13	drop inlet	12" metal pipe running under Baptist Hill to #14
14	drainage grate	has 12" metal pipe running north parallel to Baptist Hill, 12" metal pipe from #13 and 12" metal pipe south to #15
15	drainage grate	has 12" metal pipe from #14 but cannot see an outlet
16	12" round plastic inlet	pipe is incased in asphalt and drains to Shelburne Falls Road

1



2



3



4



5



6



7



8



9



10



11



12



13



14



15



16

