Ellicott City Watershed Master Plan

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Excerpted pages submitted for reference

Executive Summary

ELLICOTT CITY WATERSHED MASTER PLAN

Ellicott City is an historic community in Howard County, Maryland, located at the confluence of multiple tributaries that feed into the Patapsco River. The community is steeped in history, with much of its original architecture intact. Notable for its connections to the National Road, the original B&O Railroad line and rich mill heritage, the unincorporated town dates back to 1772. Today, Ellicott City is a regional tourism destination, a center for entrepreneurial endeavors, and a nationally significant historic district. All of these unique characteristics warranted a highly context-sensitive approach to planning and urban design provided in this master plan.

The planning effort was initiated following a deadly, historic flood which hit the town in 2016. After the initial emergency response, a series of action groups were developed to begin addressing the town's flood-prone nature. Numerous idea-generating workshops were held with focus groups and the general public, resulting in several resources outlining potential strategies for flood mitigation and improved public amenities in town. The Plan was underway for approximately one year and nearing completion when a second devastating flash flood occurred in May 2018.

This Watershed Master Plan addresses a complex set of inter-related challenges, including the opportunity to invest in useful and attractive amenity spaces while being sensitive to the community's rich history. The watershed-wide recommendations developed in this Plan are in direct response to the two historic floods and the County's vision for a future Ellicott City that lives in closer balance with the hydraulic forces that have shaped the town through the generations. Though Ellicott City will never be without flooding risk, the recommendations in this Plan will help generate a more resilient response to flood events should they occur again in the future.

PURPOSE AND SCOPE

OVERVIEW

The Ellicott City Watershed Master Plan process officially kicked off on May 31, 2017 with the goal of developing a comprehensive, community-driven vision for rebuilding a stronger and more resilient Ellicott City. Triggered by the devastating July 30, 2016 flood, the master plan effort was designed to take a fresh and creative look at potential long-term flood solutions and strategies. The effort was grounded by information gathered in the 2016 flood recovery phase, interrupted by the May 2018 flood, and then restarted with direction from the EC Safe and Sound plan for flood mitigation.

and additional recommendations emphasize applying measures to improve floodwater conveyance that help to achieve multiple master plan goals while maximizing cost effectiveness.

ELLICOTT CITY TODAY

The Tiber-Hudson Watershed and its water resources represent a complex system, with multiple flooding influences. Consequently, Ellicott City has been—and continues to be—highly prone to flooding, leaving the core vulnerable to significant property damage.

FLOODING INFLUENCES

- **Torrential Rainfall:** The July 30, 2016 storm dropped 6.6 inches in 3.55 hours; the May 27, 2018 storm dumped 6.4 inches in 3.0 hours. According to NOAA's Atlas 14 precipitation frequency estimates, a storm dropping 6 inches of rain in 3 hours in the Ellicott City area should only have a 1 in 1,000 chance of occurring in a given year. However, NOAA's research indicates these previously rare storms capable of dropping torrential rainfall are becoming more frequent. NOAA's fourth national climate assessment (2018) noted a recent dominant trend toward increased rainfall intensity in the Northeast region of which Maryland is a part. The report suggests further increases in rainfall intensity are expected in the Northeast.
- **Floodplain Encroachment:** Prior to modern floodplain regulations, human settlement in Ellicott City's core has severely encroached within the floodplains and have directly altered the location and natural functions of multiple streams—the Tiber, Hudson and New Cut Branches—and the Patapsco River.

According To The National Weather Service's Baltimore/Washington Weather Forecast Office, The Ellicott City Core Is The Location Most Vulnerable To Catastrophic Flash Flooding In Its 44-County Forecast Region.

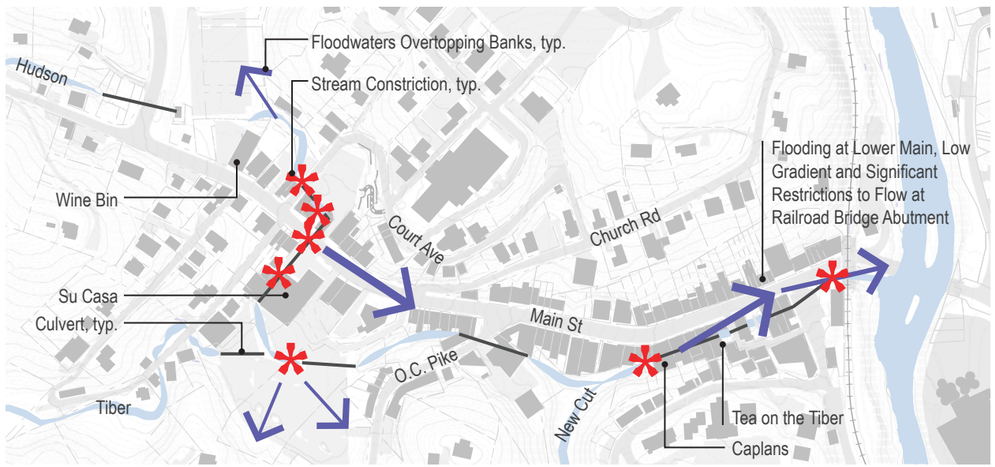

Figure 34: Stream Constriction Points and Floodwater Flows in the Downtown Core

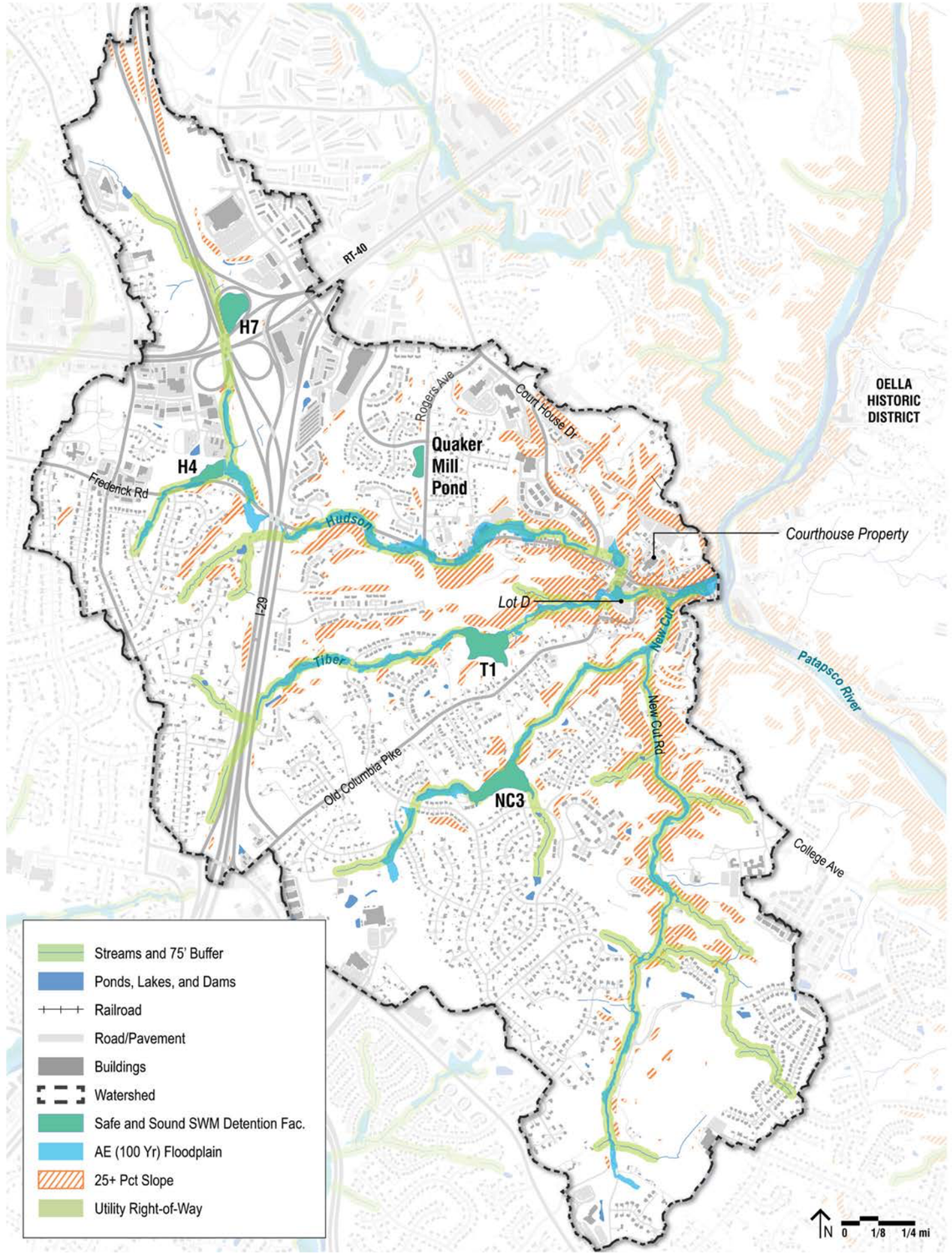

Figure 35: Watershed Diagram: Hydrology and Steep Slopes

- **Building Construction:** Buildings constructed within the floodplain span the streams in multiple locations.
- **Topography and Geology:** The topography and geology of the watershed include steep hillsides and narrow valleys comprised of shallow topsoil over granite bedrock.
- **Hindered Conveyance:** Conveyance, the tributary's capacity and performance, is hindered by a number of factors throughout the core. These include hydraulic pinch points (created at undersized crossings including culverts and bridges, sharp entrenched meander bends, floodplain constrictions, structures over the channel, etc.), increased obstructions and the presence of bedload (boulders and debris aggrading and blocking the channel), as described below (see Figure 34).
- **Stream Debris:** Debris in the channel hinders floodwaters. Debris includes fallen trees, poles, boulders, collapsed walls, pavers and other unsecured floatable items, such as cars, dumpsters, storage sheds, etc. Large debris can block culvert and bridge openings, as happened during the July 2016 and May 2018 events. Boulders and other bedload collect at various points along the channel, thereby reducing channel capacity. Existing and modeled shear stresses show levels significant enough to move boulders through the stream channel and dislodge cobblestone and brick pavement, turning it into debris.
- **Watershed Development and Redevelopment:** Because the earliest settlers in Ellicott City built dams and mill races, channelized, relocated and manipulated the stream channels/floodplains, even if most of the watershed was defined by "woods in good condition," there would still be significant flooding of infrastructure within the floodplain, as demonstrated in the Hydraulic and Hydrology (H&H) study. As the H&H study authors presented at the May 31, 2017 master plan kickoff meeting, under the "woods in good" condition scenario, a 100-year, 24-hour storm event (8.51 inches of rainfall over 24 hours) would result in 6-8 feet of water on Lower Main versus more than 8 feet under the baseline existing conditions scenario. The H&H study also illustrated that in the woods and good condition scenario, the difference between discharges grew less as the storm event grew larger.

In addition to these conveyance challenges, previous residential and commercial developments with no or limited stormwater management facilities may have also had some impact on the magnitude of flooding. A large portion of the watershed was developed before 1984, prior to any Howard County stormwater management requirements. Between 1984 and 1990, the County introduced stormwater management regulations to manage the 24-hour, two and ten-year storms (see Figure 36). Development since 1990 has been required to manage for the 100-year, 24-hour storm. In late 2019, two Council Resolutions passed (CR122 and CR123), requiring more stringent stormwater management in the Tiber watershed. These resolutions are focused on managing the high-intensity, short-duration storm (i.e. 'flash flood').

When development occurs, impervious surfaces such as roofs and pavements reduce the ability for rainwater to infiltrate into the soil and for vegetation to slow the runoff as it moves downhill. Stormwater management facilities work to counter the effect of impervious surfaces by holding runoff within the facility, promoting infiltration into the soil, and then slowly allowing the water to leave the facility to match the rate at which the water would have run off if the area were not developed but left as a stand of "woods in good condition."

COUNCIL RESOLUTIONS CR122-2019 + CR123-2019

For the Tiber-Hudson watershed, CR123 amends Volume I (Storm Drainage) of Howard County's Design Manual to require peak management control for 10-year, 24-hour storm events and 100 year, 24-hour storm events as well as 6.6-inch, 3.55-hour storm events (equivalent to the July 30, 2016 storm). This requirement will extend to all projects in the watershed, regardless of when a developer received subdivision or site development plan approval.
For redevelopment projects, the same requirements apply to achieve quantity management within the proposed limit of disturbance. With the addition of this short duration, high-intensity storm management, the county's stormwater management practices for this watershed include both long duration and short duration events while maintaining requirements to also provide the state mandated one-year, 24-hour event and water quality using small scale, filtering devices known as Environmental Site Design (ESD).

CR122 works as a companion to CR123 by more than doubling the fees-in-lieu to construct stormwater management from $72,000 to $175,000 per acre foot of water storage. The fees will only be paid if geotechnical issues exist that make managing the short duration, high intensity storm impossible on-site and there are no opportunities to implement stormwater management off-site within the same watershed. Any funds collected by the Department of Planning and Zoning (DPZ) will go toward flood mitigation efforts in the watershed.

THE SPONGE ANALOGY

In a typical watershed, the soil profile acts as a sponge to absorb runoff from a storm. A gentle rainstorm is comparable to sprinkling water on a sponge; the sponge has the time to absorb a greater amount of water over time. A heavy rainstorm, on the other hand, is comparable to pouring water on a sponge; it will just run off as there is no time for it to be absorbed.

IMPERVIOUS COVER AND STORMWATER MANAGEMENT

Impervious cover is a variable directly related to stormwater runoff, however, the perception of increased run-off from impervious cover can be disproportionate to the magnitude of a storm event. As an example, woods with a thick, unsaturated soil layer can significantly reduce the amount of runoff with a mild rate of precipitation. However, woods with a thin layer of unsaturated soils, frozen ground or light groundcover will hold very little precipitation, even during mild storm events and the water will mostly run off. Stormwater management facilities are typically designed to either increase groundwater infiltration or store/detain precipitation to reduce downstream flows. Peak flows can only be reduced if the volume of the stormwater management facility is sufficient to manage the accumulated volume of rainfall draining to the facility during peak flow times. As a result, stormwater management facilities do not typically provide significant peak flow reduction during high flow events or events with extremely intense rain events, such as 5 inches of rain over 2 hours. As another example, if one fills a gallon bucket with water from a faucet for over an hour and then increases the flow after the bucket is full, there will be no reduction in peak flow.