Mount Pleasant Drainage Study

Mockingbird and Sugar Creek subdivision

John Chlarson, P.E. MTAS Consultant

February 2021

Municipal Technical Advisory Service
INSTITUTE for PUBLIC SERVICE

The Municipal Technical Advisory Service was asked to look at drainage complaints in response to "flooding" in certain areas of Mount Pleasant.

Executive Summary:

Mount Pleasant's infrastructure has been designed and maintained in accordance with standard engineering and public works practices. Mount Pleasant has no liability in this situation.

Many local governments in Tennessee and other states are experiencing problems with short duration - high intensity rainfall events causing localized flooding. The University of Tennessee has recognized this and has started a project aimed at helping local governments address this problem in the future.(see appendix)

Looking at the drainage are under consideration, MTAS initial verbal recommendation was that Mount Pleasant investigate using the athletic field at the middle school for the original intended dual purpose, to also function as a dry detention basin.

From an email by Kate Collier:

I wanted to reach out to the school board members we have already met with on the Middle School flooding issues. We just received these videos of the September 13, 2020 flood from a resident on Mockingbird. You can use the dropbox link below to view some of what we received. What we have shown you in the past were "post rain" still shots and these are "live" in the midst of the flooding rains.

These pictures show the incredible amount of stormwater coming from the Middle School onto Mockingbird and then to the Sugar Creek subdivision. These videos are something we have not seen with the "post rain" drone shots we shared.

I know the Middle School through Eric Harvey and others received a $5,000 grant from TVA to get the students involved in determining the best way to mitigate this problem. Please keep the City up to date on the school's plans to address the situation. There are residents seeking a buyout from TEMA effected by these very flood waters. I believe if the issue can be addressed there may be no need for a buyout. Hopefully this can be addressed quickly.

From a response by Mark P. Lee, P.E., M.ASCE, SEC, inc.:

Something I noticed, the school's detention pond is not detaining. There is no outlet structure that slows the release of water. An engineer could easily analyze the situation and design a release structure that would reduce the rate of runoff. I would guess they could do it for less than $5000. Maybe $3,500. I created the LiDAR topo so that would save some money.

So, I would encourage Mount Pleasant to pursue working with the school to put this plan into action.

Report:

Based on what I have been told by the City, the flooding has occurred during relatively short, but extremely intense rainfall events.

These brief, intense rains have exceeded the capacity of the drainage infrastructure associated with the city streets in the area of concern. The water in the side ditches has overtopped the street and the top of bank and flowed out of the right of way and on to private property.

Drainage Design Best Management Practices

Best management practices in design for municipal drainage in Tennessee are typified as:

> Side ditches and storm sewers are designed for the 10 year, 24 hour event
>
> Culverts (cross drain) on local streets are designed for the 10 year, 24 hour event
>
> Culverts on the larger collector and arterial streets and state routes are designed for the 50 year, 24 hour event

Rainfall events explained:

A statistical concept often associated with hydraulic analysis is the return period of the discharge. Statistically, the return period is the reciprocal of the frequency. For example, the flood that has a 2% chance of being equaled or exceeded (frequency) in any given year has a return period of 50 years; i.e., 1/0.02 = 50 years. Note that this does not mean that this flood will occur on a regular basis every 50 years. Two 50-year floods could occur in successive years or they may occur 500 years apart. The return period is only the long-term average number of years between occurrences.

Federal Highway Administration pub. FHWA HIF 12 026

Mount Pleasant requirements:

Speaking to city employee Robert Archibald, he confirmed that the Mount Pleasant Planning Commission, in accordance with Mount Pleasant Subdivision Regulations:

- 4-105.1 … The planning commission shall not approve any plat of a subdivision which does not make adequate provisions for stormwater or floodwater run-off …

- 4—l05.203 … A culvert or other drainage facility shall in each case be large enough to accommodate potential runoff from its entire upstream drainage area, whether inside or outside the subdivision. Necessary facilities shall be sized based on the construction specifications and assuming conditions of maximum potential watershed development permitted by any zoning ordinance. …

- 4-105.303… The design and construction details of drainage facilities shall be in accordance with the provisions of these regulations. …

has subdivision plans reviewed by a professional engineer working for an engineering firm retained by the city for just this purpose. The subdivision plans are required by Tennessee law to be designed by a licensed engineer. The drainage infrastructure design is part of the subdivision plans. Therefore, the drainage infrastructure in Mount Pleasant's subdivisions has been designed by one professional engineer licensed by the State of Tennessee and the design has been reviewed and approved by another engineer, working for a different firm, who is also licensed in the State of Tennessee. This would certainly comply with the requirements set forth in the subdivision regulations.

Robert ensures that the driveway culverts and other drainage infrastructure items meet the approved plan and specification requirements.

Many subdivision regulations adopted by various cities in Tennessee specify a minimum driveway culvert size rather than looking at the hydrology for each development. Mount Pleasant's Subdivision Regulations do require such consideration, rather than defaulting to minimum sized culvert. In this, Mount Pleasant exceeds current standards of practice.

Field Visit observations

I conducted a field visit of the area in question. The drainage infrastructure that I observed appeared to have been designed and constructed in line with current municipal drainage best management practices and industry standards.

The drainage infrastructure that I observed also appeared to be properly maintained in accordance with current municipal drainage best management practices and industry standards.

Isolated, Short Duration, High Intensity Rainfall Events:

So, if there is flash flood occurring during certain rainfall events, why is that happening?

Tennessee Intensity- Duration- Frequency (IDF)– Curves and Hydrology used in design in Tennessee:

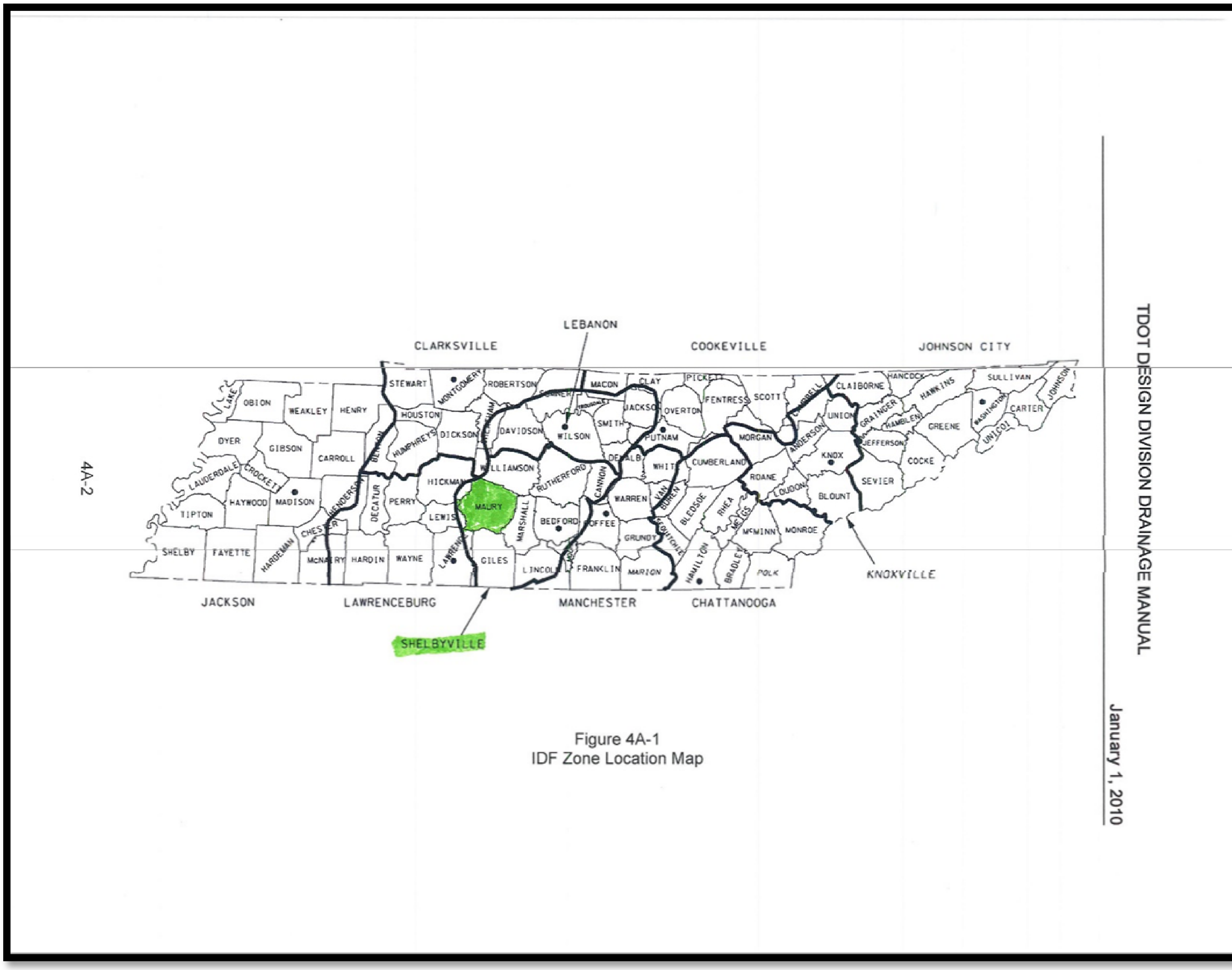

Figure 4A-1
IDF Zone Location Map

The IDF Zone Location Map above identifies the Shelbyville IDF Curve as the one to use for Mount Pleasant.

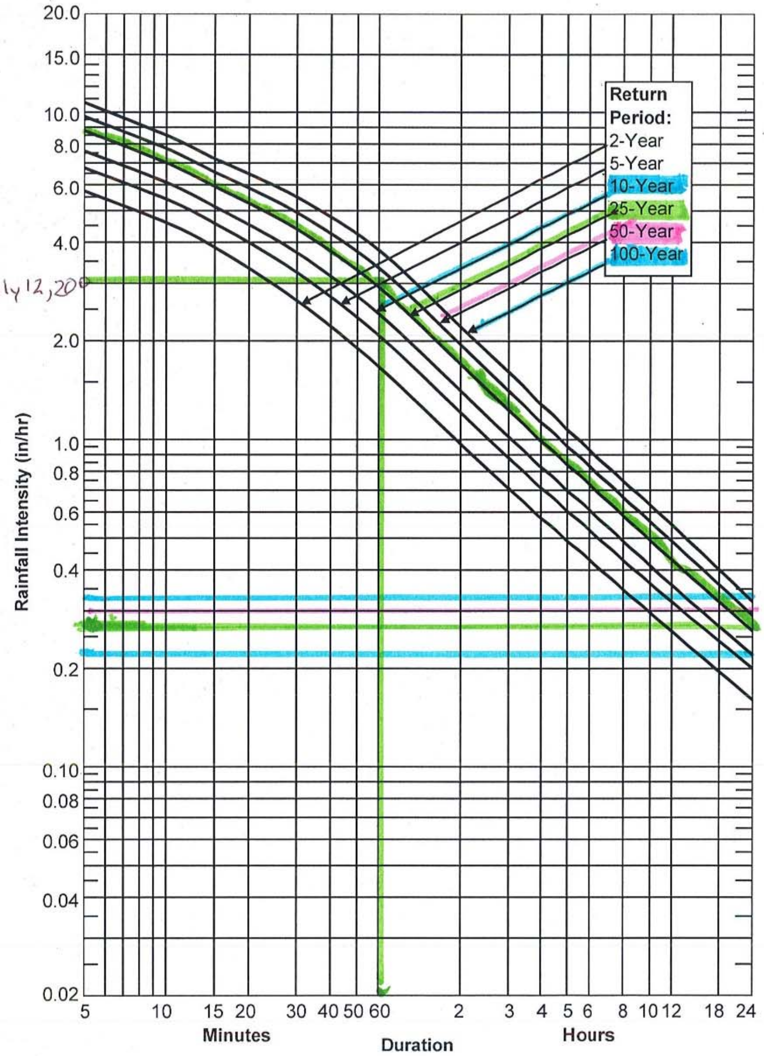

Figure 4A-11
Shelbyville IDF Curve
NOTE: T_c = 5 minutes is a minimum value to use in all cases
Reference: National Weather Service, NOAA Atlas 14, Volume 2 (2004)

Mount Pleasant- Shelbyville IDF curve with example July 12, 2020

__About IDF Curves__, Sumati Oraevskiy, May 29, 2020- FlowWorks https://support.flowworks.com/hc/en-us

An Intensity-Duration-Frequency curve (IDF Curve) is a graphical representation of the probability that a given average rainfall intensity event will occur.

…

Rainfall Intensity (mm/hour)(inches/hour- jcc), Rainfall Duration (how many hours it rained at that intensity) and Rainfall Frequency (how often that level of a rain storm repeats itself) are the parameters that make up the axes of the graph of IDF curve. An IDF curve is created with long term rainfall records. You need a lot of data. The more data you have, the more accurate your curve will be.

…

Rainfall intensity in the IDF Curve is the average rainfall depth that falls per specific time duration. Simplified, high rainfall intensity indicates that it's raining really hard and low intensity that it's raining lightly. Typically the rainfall intensity is stated in mm/hour in Canada and in inches/hour in the United States.

In the above graph, the y-axis shows the rainfall Intensity in mm/hour (inches/hour- jcc), while the x-axis shows the rainfall Duration. This is the "I" and "D" in the IDF.

The nearly parallel lines on the IDF Curve represent probability, or Frequency ("F"). Thus the 10-year line would represent rainfall events that have a probability of occurring once every 10 years. Another way to put it is that the probability of a 10-year magnitude storm (or greater) occurring in any given year is 1/10 or 10%, and of a 50-year storm occurring 1/50 or 2%. This is a statistical analysis of past data, not a prediction of actual storms.

Each plotted line in the graph represents rainfall events with the same probability of occurrence, in a range of durations (durations are shown on the x-axis). Thus moving along the 10-year line shows the probability of a 10-year storm with different durations – a 10-year 30-min storm, a 10-year 2-hour storm, or a 10-year 12-hour storm.

The last line on the curve is the actual rainfall measured during the recent event based on the data collected from the local rain gauge. In this case it falls below all the parallel lines. Where this line crosses any of the parallel probability lines, it would represent the actual Intensity, Duration, and Frequency of the storm.

TDOT DESIGN DIVISION DRAINAGE MANUAL

January 1, 2010

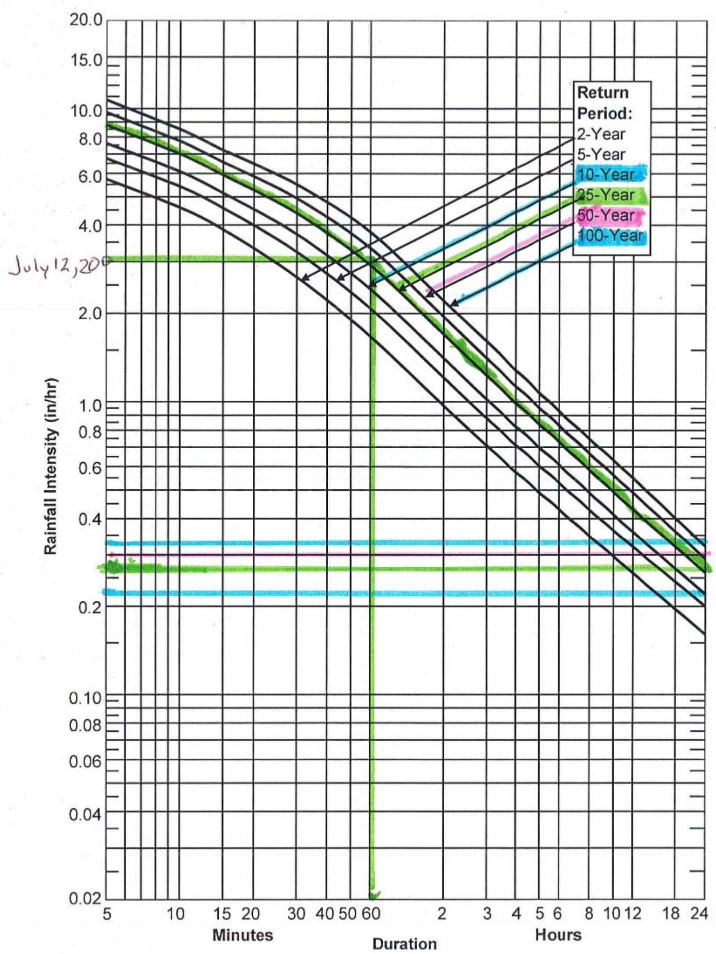

Figure 4A-11
Shelbyville IDF Curve
NOTE: T_c = 5 minutes is a minimum value to use in all cases
Reference: National Weather Service, NOAA Atlas 14, Volume 2 (2004)

4A-12

In the curves shown above I have marked information on the 10 year return curve, the 25 year return curve, and the 100 year return curve. One can see that a 10 year 24 hour rainfall event would have a rainfall intensity of approximately 0.24 inches per hour, and that is what current practice would for that drainage area to size residential subdivision ditches and culverts. A 25 year 24 hour event would yield an intensity 0.275 inches per hour. The 100 year 24 hour event would yield an intensity of 0.35 inches per hour.

An event recorded in Mount Pleasant on July 12, 2020 recorded 3.0 inches falling in hour, or an intensity of 3.00 inches per hour for one hour-which would be a volume of rainfall equivalent to the amount from a 25 year 24 hour event all falling in one hour.

Drainage infrastructure designed for carrying the runoff from that drainage area for an event with an intensity of approximately 0.275 inches per hour was receiving runoff from an event with an intensity of 3.00 inches per hour- 10.9 times the amount the infrastructure was designed to carry. That would explain short term or flash flooding.

Currently:

It is not standard practice to design drainage infrastructure to accommodate flash flood events or 24 hour flood events. Physical limitations and cost considerations are prohibitive.

John Chlarson, P.E. of The University of Tennessee's Municipal Technical Advisory Service and Dr. John Buchanan, P.E. and Dr. Andrea Ludwig, both of the University of Tennessee's Institute for Agriculture, are engaging in a study, partially driven by the Mount Pleasant drainage issues. A copy of an article about this new drainage study is included in the appendix.

As far as any other immediate actions that Mount Pleasant could take, but is not obligated to take, to address flash flooding in the Mockingbird and Sugar Creek subdivision area, I would recommend pursuing using the athletic field at the middle school for the second part of its intended dual purpose, that of a dry detention basin.

Appendix

- **Tennessee Chapter of the American Public Works Association's Tennessee Public Works Magazine article: Request for Information Regarding: Short Duration - High Intensity Rainfall Events that Caused Localized Flooding**
- **Drainage related excerpts from the Mount Pleasant Subdivision Regulations**

By John Buchanan, Ph.D., P.E. & John Chlarson, P.E.

REQUEST FOR INFORMATION REGARDING:

Short Duration - High Intensity Rainfall Events that Caused Localized Flooding

Public Works officials are very familiar with the flood-prone areas in their districts. They know the exact locations of the phone calls that come during, and after a significant storm event. Time after time, these locations will have standing water that creates hazardous conditions and property damage. Sometimes, the solution may be to remove sediment and debris from the existing storm sewers and ditches.

However, even with well-maintained drainage systems, communities still can receive storm events that overwhelm the water conveyances. The hard question that must be asked is whether the drainage system was designed to handle the storm event that caused the flooding to occur, and the answer may be "well, not really." **Stormwater Drainage Systems: Both Science and Art**

As engineers, that is a hard admission. Designing stormwater drainage systems is both a science and an art. The science is based on our understanding of hydraulics – we know how to move water. And the science is also based in hydrology. There is a fundamental principle that large, destructive storms happen less frequently than small, nondestructive storm events.

Approximately 100 years of precipitation records exist for most parts of the U.S., and these records allow hydrologists to perform statistical analyses from which they can assign the risk of a given storm to happen in a given year. And so the art of storm water engineering begins with the attempt to balance the cost of engineered storm water drainage systems, with risk of getting a storm of a given magnitude.

As a result of climate variability, the southeastern U.S. is experiencing more frequent storm events that tend to have greater precipitation rates (intensity) than our historic norms. Warmer air and

warmer oceans allow the atmosphere to carry more water vapor into the continent from the Gulf of Mexico.

When this moist air moves through localized areas of cooler air, the moisture will condense and precipitate out as a short duration, high intensity rain event. Having a rainfall downburst is not a new phenomenon; however, in a given location, we would generally expect one to happen every couple of years.

Now, it seems they are happening several times yearly. When you factor in increased development, (in many cases high density development) and the increased impervious surfaces that weren't previously upstream from existing infrastructure, it certainly aggravates the issue.

At the risk of stating the obvious, a long, slow rain event does not cause flooding and is generally considered to be beneficial. In contrast, a short and intense rain event can cause property damage and often creates hazardous conditions.

For the sake of comparison, let's assume that both types of rain events produce one inch of water. The long, slow rain event produced one inch over a five-hour period, resulting in an intensity of 0.2 inch per hour (iph). Likewise, the short, heavy rain event produced one inch of water in 20 minutes, and the resulting intensity was 3 iph.

Intensity of the Rain Events: The Defining Factor

The simple difference between these two rain events is the intensity – the rate by which water is applied to the land. Intensity is the power of a storm event to create flooding, soil erosion, and other forms of property damage.

A community's stormwater drainage system must be able to match the rainfall intensity. When one inch of rain falls over one acre of ground, 27,156 gallons of water (also called an acre-inch) must go somewhere. In the case of our long duration, low intensity rain event, the 27,156 gallons had five hours to move out through the drainage system.

When we receive the short duration, high intensity events, the drainage system may not be able to convey this volume of water at the required rate – resulting in water being stored until the drainage system can catch up. Simply said, uncontrolled water storage is "engineer-speak" for a flood.

Stormwater Management System Designs Vary

Stormwater management systems are designed using well-established engineering practices. Inherent to these practices is the use of synthetic storms that have a 24-hour duration and a 10% (or less) probability of occurring in a given year. For example, a new culvert being installed near Oak Ridge, Tennessee might be designed based a 10-year return period storm, 24-hour duration event that would produce 4.64 inches.

Using a 10-acre residential neighborhood as an example, and using the standard assumptions about the rainfall distribution pattern during the event, an engineer may design that culvert to handle a peak flow of 24 cubic feet per second (cfs). However, what happens if that same storm produces the same depth of rainfall in only 12 hours?

Using the same methods, it can be estimated that the peak flow rate would be 28 cfs. If the duration of this event were to be reduced to six hours, then the model suggest that the peak flow rate would increase to 33 cfs.

So, in fact, the culvert was not designed to handle these shorter duration storms that produce the same depth of precipitation as the longer duration storm. As mentioned above, we always have had these storm events that produce a greater runoff rate than predicted by our traditional design practices. However, with climate change, we receive these storm events more frequently.

Here's How You Can Help

We need your assistance. If your community has (or has access to) a tipping bucket rain gauge that is set to record rainfall depth every 15 minutes, we would like for you to identify a couple of short rainfall events that lasted less than six hours and produced two or more inches of rain.

Even if you do not have access to a tipping bucket rain gauge, the USGS has 52 of these rain gauges distributed across Tennessee and the NOAA has 21. If you can provide the dates, then we will go to those agencies and see if their rain gauges were able to capture the storm event.

There are several other rain gauge networks across the State, but they only record daily values. The benefit of the 15-minute data is that it provides rainfall intensity in addition to the total storm depth. By their very nature, these short duration, high intensity rainfall events are typically very localized.

This localization, and even isolation, makes collecting firsthand accounts with any supporting data from municipalities very difficult. That is why your assistance is so very important to us. Accounts with the rainfall data, pictures and even videos would be invaluable.

We hope to gather this information and use it to demonstrate to Public Works officials and to the public how these short duration, high intensity events may drive changes in how storm water systems are designed and maintained. Or, at very least, provide a sense for the risk that these storm events have on low-lying areas.

When irate citizens with existing infrastructure are threatening to sue, we hope to be able to provide helpful information for local governments to use. That information could be reflected in cost comparisons for infrastructure designed using the traditional best engineering practices, versus cost data for infrastructure and control measures designed to better accommodate these short duration, high intensity rainfall events.

Also, your assistance may help give information on what such infrastructure could add to development costs. We intend to look at infrastructure retrofit costs, so that the public can be educated on what their cost would be for dealing with these events in established developments.

We look forward to hearing from you. tpw

John R. Buchanan, Ph.D., P. E.

Associate Professor and Extension Specialist

Construction Science, Water and Wastewater Eng. Biosystems Engineering and Soil Science jbuchan7@utk.edu John C. Chlarson, P.E.

Public Works Consultant

UT Municipal Technical Advisory Service john.chlarson@tennessee.edu

Drainage related excerpts from the Mount Pleasant Subdivision Regulations

1-104 Policy and Purpose

…

Land shall not be subdivided until proper provisions have been made for drainage, water, sewerage, other public utilities, and for other required public services. …

…

These regulations are adopted for the following purposes:

…

J. To prevent the pollution of air, streams, and ponds; to assure the adequacy of drainage facilities; to safeguard the water table; and to preserve the integrity, stability, beauty, and value of the jurisdictional area.

…

2-101.4 Policy of Flood-Prone Areas
In determining the appropriateness of land subdivision at any site containing a flood-prone area, the planning commission, in reviewing any plat, shall consider the policy and purpose set forth in Section 1-104 of these regulations and, additionally:
1. the danger to life and property due to the increased flood heights or velocities, either potential or actual, caused by subdivision fill, roads, and intended uses;
2. the danger that intended uses or improvements may be swept onto other lands or downstream to the injury of other;
3. the adequacy of proposed water supply, sanitation, and drainage systems, and the ability of these systems to function under flood conditions;
4. the susceptibility of the proposed facility and its contents to flood damage and the effect of such damage upon the individual owner;

…

4—l0l.4 Character of the Land
Land which the planning commission finds to be unsuitable for subdivision or development due to flooding, improper drainage, steep slopes, rock formations, adverse earth formations or topography, utility easements, or other features which would be harmful to the safety, health, and general welfare of inhabitants of the land and surrounding areas shall not be subdivided or developed unless adequate methods are formulated by the developer and approved by the planning commission, upon recommendation of any staff assistant serving the planning commission and/or other

governmental representative, if any, to solve the problems created by the unsuitable land conditions. Such land shall be set aside for such uses as will not involve such a danger.

Where protection against flood damage is necessary, in the opinion of the planning commission, flood-damage protection techniques may include, as deemed appropriate by the planning commission:
1. the imposition of any surety and deed restrictions enforceable by the planning commission to regulate the future type and design of uses within the flood-prone areas; and
2. flood protection measures designed so as not to increase, either individually" or collectively, flood flows, height, duration, or damages, and so as not to infringe upon the regulatory floodway.
3. installation of flood warning systems.
4. the use of fill, dikes, levees, and other protective measures.
5. the use of floodproofing measures, which may include:
(a) anchorage to resist flotation and lateral movement.
(b) installation of watertight doors, bulkheads, shutters, or other similar methods of closure.
(c) reinforcement of walls to resist water pressures.
(d) use of paints, membranes, or mortars to reduce seepage through walls. *
(e) addition of mass or weight to structures to resist flotation.
(f) installation of pumps to lower water levels in structures.
(g) construction of water supply and waste treatment systems so as to prevent the entrance of or contamination of flood waters.
(h) installation of pumps or comparable facilities for subsurface drainage systems to relieve external foundation wall and basement flood pressures.
(i) building design and construction to resist rupture or collapse caused by water pressure of floating debris.
(j) installation of valves or controls on sanitary and storm drains which permit the drains to be closed to prevent backup of sewage and stormwater into buildings or structures.
(k) location and installation of all electrical equipment, circuits, and appliances so that they are protected from inundation by the regulatory flood.
(l) location of storage facilities for chemicals, explosives, buoyant material, flammable liquids, or other toxic materials which would be hazardous to the public health, safety, and welfare at or above the regulatory flood protection elevation, or design of such facilities to prevent flotation of storage containers or damage to storage containers which. could result in the escape of toxic materials.
The acceptability of any flood protection methods formulated by the subdivider or his agent shall be determined by the planning

commission, which shall be guided by the policies set forth in Section 1-104 and Subsection 2-101.4, of these regulations and Article IV, of the zoning ordinance.
All such flood protection measures shall be designed so as not to increase, either individually or collectively, flood flows, heights, duration, or damages so as not to infringe upon the regulatory floodway.

…

4-102.502 Lot Drainage
Lots shall be laid out so as to provide positive drainage away from all buildings, and individual lot drainage shall be coordinated with the general storm drainage pattern for the area which includes subsurface drainage. Drainage shall be designed so as to avoid concentration of storm drainage water from each lot to adjacent lots.
The planning commission reserves the right to set minimum elevations on all floors, patios, and building equipment.
This prerogative to establish elevation exists in addition to any ordinances that refer to floodplain elevation requirements. The content of the preceding paragraph is to give summary review powers over any calculated or historical evidence of storm water presence in overland or channel conditions.
The subdivision developer will insure that all artesian ground waters of a permanent or temporary nature will be intercepted and carried away to primary drainage conduits along swaled ditches or in underground pipes on property line easements. Regardless of the location of property lines, intercept will be allowed by the planning commission at the point of artesian surfacing.
The intent of this paragraph is to prevent flooding by overland flow. The developer is obligated to perform this work upon evidence of artesian water for a period of one (1) year following acceptance of all roads and utilities.

…

4-103 Public Ways

…

4-103.103 Improvements in Floodable Areas
The finished elevation of proposed public ways subject to flood shall be no more than one foot below the regulatory flood protection elevation. The planning commission may require profiles and elevations of public ways to determine compliance with this requirement. All drainage structures shall be sufficient to discharge flood flows without increasing flood height. Where fill is used to bring the finished elevation of any public way to the required elevation, such fill shall not encroach upon a floodway, and the fill shall be protected against erosion by rip-rap,

vegetative cover, or other methods deemed acceptable by the planning commission.

…

4—l03.l05 Topography and Arrangement

…

e. Minor public ways shall be laid out to conform as much as possible to the topography; to discourage use by through traffic; to permit efficient drainage and utility systems; and to require the minimum ways necessary to provide convenient and safe access to property.

…

4—l03.4 Public Way Surfacing and Improvements

…

All public ways pavements, shoulders, drainage improvements and structures, any' curb turnabouts, and sidewalks shall conform to all construction standards and. specifications I adopted by the planning commission and shall be incorporated into the construction plans required to be submitted by the developer for plat approval.

…

4-105 Drainage and Storm Sewers

4-105.1 General Requirements

The planning commission shall not approve any plat of a subdivision which does not make adequate provisions for stormwater or floodwater run-off channels or basins. The stormwater drainage system shall be separate and independent from any sanitary sewer system.

4-105.2 Nature of Stormwater Facilities

4-105.201 Location

The subdivider may be required by the planning commission to transport by pipe or open ditch any spring or surface water that may exist prior to or as a result of the subdivision. Such drainage facilities shall be located in the public way right—of-way, where feasible, or in perpetual unobstructed easements of appropriate width and shall be constructed in accordance with the construction specifications contained in these regulations.

4-105.202 Accessibility to Public Storm Sewers

a. Where a public storm sewer is accessible, the developer shall install storm sewer facilities, or if no outlets are within a reasonable distance, adequate provision shall be made for the disposal of stormwaters, subject to the specifications of the appropriate governmental representative; inspection of facilities shall be conducted to assure compliance. Inspection of facilities

shall be conducted by the enforcing officer.
b. If a connection to a public storm sewer will be provided eventually, as determined by the planning commission, the subdivider shall make arrangements for future stormwater disposal by a public system at the time the plat receives final approval.

Provisions for such connection shall be incorporated by inclusion in the performance bond required for the final subdivision plat.

4—l05.203 Accommodation of Upstream Drainage Areas
A culvert or other drainage facility shall in each case be large enough to accommodate potential runoff from its entire upstream drainage area, whether inside or outside the subdivision. Necessary facilities shall be sized based on the construction specifications and assuming conditions of maximum potential watershed development permitted by any zoning ordinance.
4-105.204 Effect on Downstream Drainage Areas
The planning commission also shall study the effect of each subdivision on existing downstream drainage facilities outside the area of the subdivision. Where it is anticipated that the additional runoff incident to the development of the subdivision will overload an existing downstream drainage facility, the planning commission may withhold approval of the subdivision until provision has been made for adequate improvement of such drainage facilities in such sum as the planning commission shall determine. No subdivision shall be approved unless adequate drainage will be provided to an adequate drainage watercourse or facility.

…

4-105.205 Areas of Poor Drainage
Whenever a plat is submitted for an area which is subject to flooding, the planning commission may approve such subdivision; provided, that the applicant fills the affected floodway fringe area of said subdivision to place public way elevations at no more than twelve (12) inches below the regulatory flood elevation and first floor elevations (including basements) at no less than one (1) foot above the regulatory flood elevation. The plat of such subdivision shall provide for a floodway along the bank l of any stream or watercourse of width sufficient to contain or move the water of the regulatory flood, and no fill shall be placed in the floodway; neither shall any building nor flood—restrictive structure be erected or placed therein. The boundaries of the floodway and if floodway fringe area, and the regulatory flood elevation, shall be determined by the planning commission based upon the review specified in Subsection 2—103.2 of these regulations and the submission of flood data in construction plans as specified in Section 5-

103 of these regulations.

4-105.206 Floodplain Areas

The planning commission may when it deems it necessary for the health, safety, or welfare of the present and future population of the area or necessary to the conservation of water, drainage, and sanitary facilities, prohibit the subdivision of any portion of the property which lies within the floodplain of any stream or drainage course. The regulatory floodway shall be preserved from any and all destruction or damage resulting from clearing, grading, or dumping of earth, waste material, or stumps. Any subdivision which contains flood-prone land shall be subject to the special provisions set forth in Subsections 2-101.4; 4-101.4; Section 4-104; and Subsection 4-105.2, of these regulations.

…

4—105.3 Dedication of Drainage Easements

4-105.301 General Requirements

Where a subdivision is traversed by a watercourse, drainageway, channel, or stream, there shall be provided a stormwater easement or drainage right-of-way conforming substantially to the lines of such watercourse and of such width and construction as will be adequate Where open drainageways are utilized they shall be designed for the twenty-five (25) year frequency flood.

4-105.302 Drainage Easements

a. Where topography or other conditions are such as to make impracticable the inclusion of drainage facilities within a public way right-of—way, perpetual unobstructed easements at least ten (10) feet in width for such facilities shall be provided across property outside the public way lines and with satisfactory access to public ways. Easements shall be indicated on the preliminary and final plats. Drainage easements shall be carried from the public way to a natural watercourse or to other drainage facilities.

b. When a new drainage system is to be constructed which will carry water across private land outside the subdivision, appropriate drainage rights must be secured and indicated on the plat.

c. The applicant shall dedicate, when required by the planning commission, either in fee, or by drainage or conservation easement, the land on both sides of an existing watercourse to a distance to be determined by the planning commission.

d. Along watercourses, low—lying lands within any floodway, as determined by the planning commission pursuant to Section 2-103 of these regulations, whether or not included in areas for dedication, shall be preserved and retained in their natural state as drainage ways.

…

4-105.303 Ditching, Concrete Ditch Paving, and Culverts and Storm Drains

The design and construction details of drainage facilities shall be in accordance with the provisions of these regulations. The design and construction details of all such facilities shall be approved by the appropriate governmental representative.

…

5-102 Preliminary Plat

…

5. the location of existing public ways, easements, water bodies, streams, and other pertinent features, such as swamps, railroads, buildings, parks, cemeteries, drainage ditches, and bridges, as determined by the planning commission;

…

8. culverts, driveway tiles, associated drainage structures sized along with necessary easements; electrical and telephone easements;

…

21. The following notations:
(a) explanation of drainage easements;

…

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mtas.tennessee.edu