



Town of Carrboro

Town Hall
301 W. Main St.
Carrboro, NC 27510

Agenda Item Abstract

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Agenda Date: 2/11/2014

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In Control: Board of Aldermen

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TITLE:

Storm Water Design Standards - future considerations

PURPOSE: The purpose of this item is to provide the Board of Aldermen an opportunity to discuss possible future changes to storm water design standards in light of recent flooding issues and concerns about climate change.

DEPARTMENT: Public Works Department and Planning Department

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INFORMATION:

Last fall the Board of Aldermen expressed an interest in having a discussion about possible future changes to storm water design standards. The interest in this subject stemmed from a significant rainfall event (June 30, 2013) and also from concerns about climate change. In order to help facilitate a discussion on this matter Town staff is providing the following information:

1. Recent flooding concerns (Map)
2. Basis for Carrboro Storm Water Design Standards
3. FEMA Repetitive loss
4. Update on various storm water problem areas

1. Recent Flooding concerns

On Sunday, June 30, 2013, the Town experienced a significant rainfall event which created flooding at several locations within the Town and surrounding communities. Approximately five (5) inches of rain fell over a twelve hour period, but more importantly a little over 3 inches of rain fell in just two hour towards the end of the event. Important to note is that rainfall was relatively consistent throughout the area based on the similar recorded amounts in rain gauges at Public Works (south part of Town), a rain gage on Oak Ave. (central), and at the Horace Williams airport (E of Town).

Agenda Date: 2/11/2014

File Type:Agendas

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Version: 1

Emergency services personnel responded to many calls about street flooding and water coming out of stream banks. Several homes in the town experienced flooding including a few homes along Tom's Creek and unfortunately the Rocky Brook trailer court also received significant flood damage. Other examples of reported damage were a washed out section of Board Street and water over topping the road along Old Pittsboro Rd.

Public Works staff documented many of the locations where flooding was reported or observed during and after the rain event and is shown on the attached map. Yellow shaded text indicates locations where storm water entered structures. Gray shaded text indicates locations where there was damage to town infrastructure. A general statement can be made that most of the flooding calls are within areas that were developed before the Town's storm water regulations were put in place (1995). This could be an indicator that perhaps the current regulations being used for new development are adequate.

2. Basis for Carrboro Storm water Design

Over the past twenty years the Carrboro LUO has been amended and expanded to include regulations to abate existing flooding problems and to prevent new ones. These amendments included new storm water standards promulgated by FEMA and NCDENR, but more importantly, the town responded proactively to adopt a Storm Drainage Design Manual to set minimum standards that address previously unregulated flooding. In the early 1990's the State of North Carolina enacted the NPDES Storm water Rules regulating surface water discharges of stormwater into streams. In the wake of Hurricane Floyd in 1999 the State of North Carolina established the North Carolina Floodplain Mapping Program. The purpose of the program was to establish a state agency to enforce FEMA regulations regarding Special Flood Hazard Areas. In August, 2009 the State enacted the Jordan Lake Rules which would eventually require each municipality to enforce buffer requirements for streams within their jurisdiction. The Town of Carrboro again proactively incorporated each of these required programs into their overall Stormwater Program to augment the requirements for storm water design guidelines. Of these mandatory and self-imposed programs the FEMA Floodplain regulations and the Carrboro Storm Drainage Design Manual are essential to the prevention of flooding.

Adoption of the FEMA Flood Hazard Program by the local governing jurisdiction allows owners of structures subject to flooding by the 100-year storm to obtain federally funded flood insurance. FEMA provides Flood Insurance Rate Maps (FIRM) and Flood Profiles on larger streams showing the areas of flooding as well as the elevation of the flood. FEMA uses the best available technical data to create the FIRM's including statistical information for stormwater discharges, hydrologic and hydraulic modeling, rainfall data and topographic surveys. The updated and current FEMA Study for Orange County was released in May 2008 and replaced the previous study of August 1979. Discharges for the study were based on existing development within the watershed and were estimated using the US Department of Interior publication [The National Flood-Frequency Program - Methods for Estimating Flood magnitude and Frequency in rural and Urban Areas In North Carolina, 2001](#). The equations for establishing peak discharge are based on one of the three separate Hydrologic Regions in North Carolina and are calibrated where applicable, using historical high-water marks

Agenda Date: 2/11/2014

File Type:Agendas

In Control: Board of Aldermen

Version: 1

obtained from interviews of residents and associated surveys. The equations were developed using historical USGS gage data from over 360 sites statewide. The HEC RAS model (Version 3.1.2) used as the Hydraulic Model to predict the elevations of the 100-year storm was released as an update of the original HEC RAS model in June 2004. The latest update of the FEMA study for Orange County is currently under review by the community. The new study will incorporate updates to both the USGS Hydrologic analysis as well as to the HEC RAS model (Version 4.1, Jan 2010)

The Carrboro Storm Drainage Design Manual was adopted around 1995 and has been updated to keep abreast of new developments in storm water regulations. The manual outlines design requirements for storm drainage for streets and local development sites outside the FEMA areas. The purpose of these requirements is to provide adequate conveyance of storm water without causing flooding of proposed streets, houses or buildings, or up or downstream properties. The manual was developed based on experience gained in dealing with the existing flooding problems in Carrboro, reference material from NCDOT and other local storm water programs and applicable state and federal storm water legislation. The current design standards include conveyance of the 10-year storm for storm drainage systems and conveyance of the 25-year storm for culverts crossing under roads. In addition no increase in the flood levels expected from the 100-year storm event are allowed to occur on upstream properties due to development on lower properties. The peak discharges associated with these events for smaller watersheds are generally computed using the Rational Method. In the Carrboro area the 10-year storm discharge is based on a rainfall event of approximately 6.0 inches/hour (based on National Oceanic and Atmospheric Administration statistical data) for the Rational Method. The 25-year storm is based on a rainfall event of approximately 7.0 inches/hour. For most areas monthly rainfall data gathered by NOAA has been accumulated for the past 100-years in order to arrive at these numbers. As a base of reference, the highest hourly reading during the storm which occurred on June 30, 2013 was 2.09 inches in one hour.

As previously mentioned most hydrologic analyses are based on studies of statistical data produced either by NOAA or the USGS and these procedures are based on historical rainfall data that is derived from the record of actual climatic events. If weather patterns were to change in response to whatever naturally evolving or human inspired conditions these shifts or trends would be revealed and appropriate revisions in the base data would be made. Both of these agency's procedures have been updated as additional data continues to be gathered over time and is revised and improved as weather patterns and climate change. The Engineering community constantly monitors changes in computational methodologies that will enable us more accurately predict peak discharges of storm events so as to continue to safeguard life, health, and property and to promote the public welfare.

3. Flood Mitigation Assistance (FMA) grant - response to flooding along Tom's Creek

In late July 2013, staff learned that the Federal Emergency Management Agency had released a notice of funds available for the Flood Mitigation program (FMA). An initial letter of interest was submitted, pertaining to four

Agenda Date: 2/11/2014

File Type:Agendas

In Control: Board of Aldermen

Version: 1

properties in the Plantation Acres neighborhood based on historical and recent flooding, as communicated to staff in meetings held in the neighborhood that summer. After further communication with property owners, four properties were discussed with the Board of Aldermen on October 15th. The Board of Aldermen authorized the submittal of two grant applications, one for acquisition of two properties and one for elevation of two properties. The total cost estimate for projects is \$746,857. A 25 percent local match, which can be met through in-kind contributions and cash match from the owners, is required. If approved, grant funds are expected to be available early in federal fiscal year 2015.

4. Update on various storm water problem areas

The following is a status update on various locations where Town staff is working to address storm water drainage concerns:

- *Tom's Creek* - Following the suggestion of one of the neighbors along Tom's Creek, Town staff set up a series of meetings to go door to door and ask homeowners what problems they have and here about concerns and suggestions. There were 5 neighborhood meetings held from mid-July to early August and 16 out of 39 property owners came to the meetings and helped to answer questions on survey sheets. A summary of the surveys is attached. More evaluation is needed.
- *105 Morningside Drive - yard flooding, water overtops the road, request to enlarge culvert.* Staff has visited with the adjacent resident and discussed possible options. Preliminary analysis indicates that enlarging the culvert under Morningside will likely cause negative impacts downstream. Replacing sections of curb and/or installing some storm inlets may help mitigate the problem.
- *400 Block of Broad St. - water overtopped road on June 30th, public road damage and private property damage. petition received, request to enlarge culvert.* An emergency repair was made at this location costing about \$10,000. Preliminary review indicates the culvert would need to be enlarged from an 18" to 48" to meet current standards. Potential downstream impacts need to be reviewed as well as well as other possible options. Cost estimates for options need to be determined and programming in the CIP considered.
- *Old Pittsboro Road - concerns expressed about storm water run-off, sewage in the drainage ditch, sitting water.* Staff is still in the early stages of evaluating the storm water run-off issues. Ideas suggested such as widening the drainage ditch or piping the storm water could possibly be considered. OWASA made a repair last summer to address sewage backing into a storm junction box. As a follow up to that repair OWASA also did some public education outreach to citizens and businesses about the detriments of putting fats, oils and grease in sanitary sewers as requested by the BOA.
- *Tributary to Morgan Creek adjacent to Public Works* - While clearing scrub trees this winter adjacent to the culvert pipes under Public Works Drive, Public Works staff has discovered significant erosion of the stream bank adjacent to the Public Works property. Appears to be a result from June 30, 2013 storm event. Location is still being evaluated to determine extent of repair work needed. Cost estimate for repair needs

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to be determined and programming in the CIP considered. A temporary more immediate repair may be necessary.

- *Wilson Park Multi-Use Path - Erosion along edge of path due to storm system overloading.* An emergency repair was made by the Public Works Department. Repair work seems to be holding and will continue to monitor location.
- *Existing Capital Improvements Planning and Relationship to Flooding -* To date, the management practices identified for making progress under the existing development provisions of the Jordan Lake Rules have not in general been located in areas experiencing higher impacts from flooding. It is possible that some retrofit opportunities identified could have a small flood (peak flow) mitigation result, although additional analyses will be necessary to quantify the potential to mitigate flooding. The retrofits identified will reduce total stormwater volume, and in doing so, protect stream channels from erosion and provide groundwater recharge benefits.
- For several years, Town staff have been identifying retrofit opportunities to comply with the existing development provisions of the Jordan Lake Rules which are based on reducing nitrogen and phosphorus in runoff. As was noted in the recent review of the CIP for FY 2014-15 to so19-20, modifications to the state law (SL 2013-295), delay the previously mandated implementation by three years. Planning has continued, to so as: 1) not to lose sight of the federal* and state requirement which may result in a significantly larger obligation in years ahead; 2) advance commitments to improving water quality in Bolin Creek and Morgan Creek; and 3) respond due to uncertainty about the interrelationship of to responsibilities under the Town's NPDES permit. The design storm used for designing BMPs under the Jordan Lake rules is the 1" rain event; flow beyond 1" as in flood events generally bypasses the BMP and is not retained or detained. So for a 5" rain and flood event, 4" will bypass a stormwater device designed to reduce nitrogen and phosphorus.
- *The past year has resulted in State legislation which has delayed implementation. It is noteworthy that Jordan Lake is considered to be impaired by EPA, and is under a federal "TMDL". Current or future changes in State level implementation could be challenged at the federal level.

FISCAL & STAFF IMPACT: No fiscal impact with the accepting this report. There may be significant fiscal impacts in the future depending on solutions determined to adequately address some of the problem areas.

RECOMMENDATION: It is recommended the BOA review and discuss the information provided, and further direct the Town staff on this matter.