

Floodplain Stakeholder Report

Floodplain Management Regulatory Review

STORMWATER MANAGEMENT ORDINANCE

BL2010-794



Prepared for

**METROPOLITAN GOVERNMENT
NASHVILLE AND DAVIDSON COUNTY**

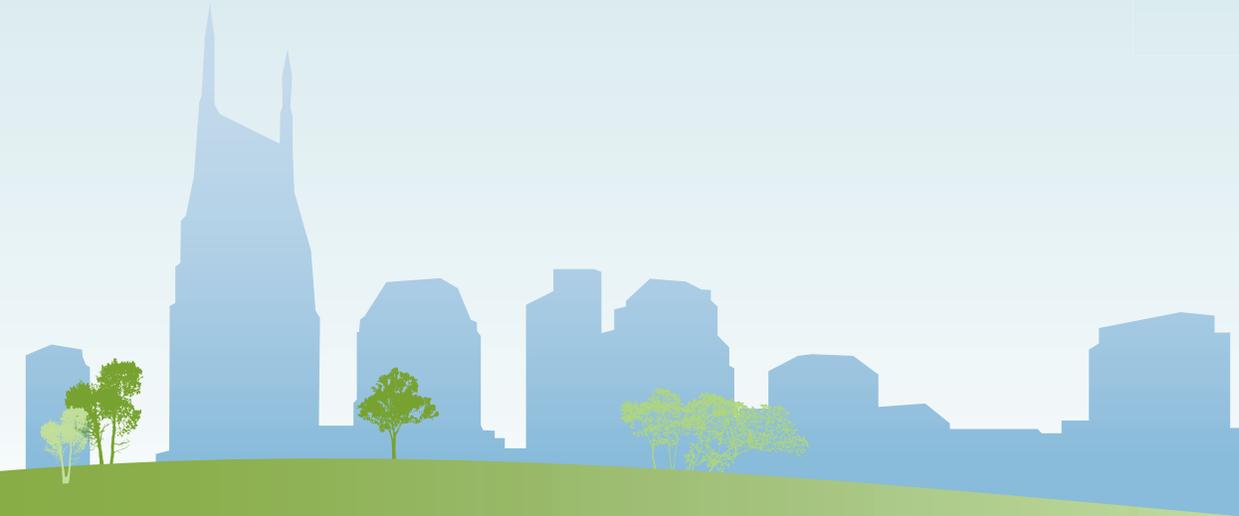


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Executive Summary

In response to the May 2010 flood, Metro Council passed Ordinance BL2010-794 in December 2010. This Ordinance instructed Metro Water Services (MWS) to examine the flood policies of the Metropolitan Government of Nashville and Davidson County (Metro) and to develop a Low Impact Development Manual (LID). LID is a development approach that reduces the amount of stormwater leaving a site, which can reduce impact of small storms on flooding.

In response to the Ordinance, MWS established a stakeholder committee comprised of two working groups: a LID group and a Floodplain Management group. The Floodplain Management group, hereinafter referred to as the Committee, met on four occasions to discuss current regulations from the perspective of No Adverse Impact (NAI).

During the Committee meetings, an emphasis was placed on items that physically impact flooding and therefore address the charge of the Ordinance. These items were grouped into five topical areas for Committee discussion: Building Location, Floodplain Disturbance, Structure Elevation, Detention, and Floodplain limits.

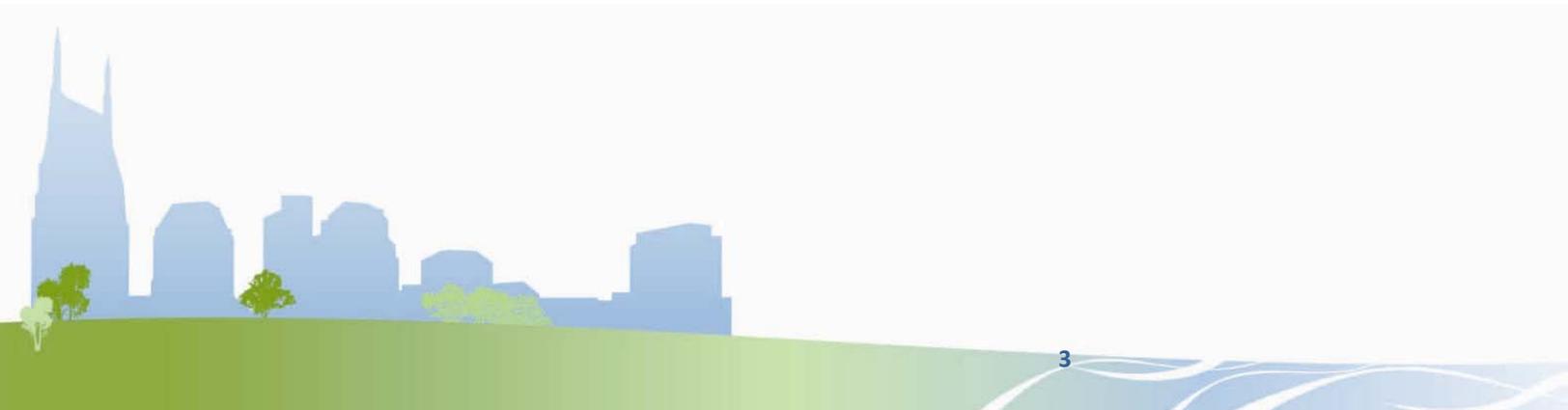
The Committee decided that Metro's current development restrictions in the floodway and floodplain are appropriate. In regards to building elevations within the floodplain, the Committee recommended that a full buildout condition be used to establish the First Floor Elevations (FFE) and that small retail businesses should have regulations similar to residential development. They also confirm that businesses and residences adjacent to the floodplain should have some elevation requirement.

In order to reduce the impact of development on downstream properties, the Committee recommended a few additions to Metro's Detention Criteria. First they suggested that stormwater master plans be developed and utilized in the development process. Where master plans are not yet available, detention requirements should be strengthened to ensure development does not impact downstream properties. MWS should consider regional detention facilities where feasible and cost effective for both developers and Metro.

Based on the Committee's recommendations, discussions between the consultant team and MWS staff, and feedback from other departments, MWS will integrate the following recommendations into their future floodplain policies and regulations:

- Full buildout conditions should be developed for all watersheds where continued development is anticipated to significantly raise the floodplain elevation and used to set appropriate FFE. In watersheds where full buildout conditions are not determined or are unlikely to differ from current floodplain elevations, MWS should continue to use its current regulations. MWS should also consider a protocol to identify small retail businesses and increase their level of flood protection.
- MWS should identify streams or watersheds where new flood elevation studies were not performed by the Federal Emergency Management Agency (FEMA) or the U.S. Army Corps of Engineers (USACE) and prioritize them for study updates.
- MWS should develop or update master plans for all watersheds. MWS should also coordinate with Metro Planning on the development of Sub-Area Plans and develop a protocol to incorporate stormwater management needs into the planning process.

- MWS should modify the engineering analyses required for detention basins to include a hydrologic and hydraulic study of the downstream conveyance system to ensure that new development does not adversely impact downstream properties.
- MWS should pursue opportunities for regional detention.
- Along streams where floodplains are established, MWS should require that all new structures built adjacent to the floodplain be elevated to the same elevation as proximate structures inside the floodplain.



1. Introduction

ORDINANCE AND CHARGE

The Metropolitan Government of Nashville and Davidson County (Metro) initiated its floodplain management program with the adoption of the Stormwater Management Ordinance No. 78-840. Over the past 30 years, Metro has adapted and strengthened its floodplain regulations in response to changes in national policy and the evolution of floodplain science. The May 2010 flood provided an opportunity to assess the effectiveness of these policies and determine if additional restrictions are appropriate.

Low Impact Development (LID) is a planning and engineering design approach to land development that includes conservation of natural features and the infiltration, evapotranspiration, and re-use of stormwater on the site where it is generated. LID practices can also be referred to as Green Infrastructure (GI) and includes strategies such as green roofs, bioretention, and pervious pavement. LID reduces the volume of stormwater that leaves a property and can therefore reduce the flooding impact of certain small storms.

Metro Council passed **Ordinance BL2010-794** in December of 2010 with the purpose of (1) examining ways to reduce risk to citizens and property from future flooding events and (2) increasing the utilization of GI and LID on all new or significantly redeveloped sites in Metro. In order to address these goals, Metro Water Services (MWS) was given the following charges:

1. Creation of Volume 5 – “Low Impact Development Manual” of the Stormwater Management Manual including provisions addressing:
 - Management of floodplain development
 - No Adverse Impact (NAI) for site design
 - Removing barriers to LID
 - “In-lieu of” program to promote LID
 - Minimum floor elevation requirements for residential and non-residential development
2. Establishment of a stakeholder committee to assist in development of the LID Manual

This document serves as a supplement to the LID Manual and specifically addresses the floodplain management assessment process including the stakeholder suggestions and the resulting policy recommendations.

2. Committee Formulation

PARTICIPATION AND REPRESENTATION

The Stakeholder Committee members were selected based on their knowledge and experience with LID and floodplain management and consisted of representatives from Metro Council, MWS, the development community, non-profit organizations, professional organizations, and the Mayor’s Office. The Stakeholder Committee was then divided into two working groups, LID and Floodplain Management, to facilitate focused discussions. The participants in the Floodplain Working Group and their affiliations are listed in **Table 1**. The views and recommendations of the Floodplain Working Group of the Stakeholder Committee hereinafter referred to as the Committee, will be the focus of this document.



Table 1. Floodplain Working Group Participants	
Name	Affiliation
Chris Bowles	Mayor’s Office
John Brittle Jr.	Village Real Estate
Emily Evans	Metro Council
Jim Forkum	Metro Council
Jeff Haynes/Adam Ballash	Boyle Investment Co.
Shawn Henry	Tune, Entrekin, White
Michael Hunkler	Gresham, Smith Partners
Darren Jernigan	Metro Council
Audra Ladd	Land Trust
Roger Lindsey	MWS
Bert Mathews	The Mathews Co.
Ryan Peebles	Associated Builders and Contractors
Barry Quinn	Barge Cauthen
Wendy Smith	World Wildlife Federation
Ann Tidwell	Greenways for Nashville
James Weaver	Waller Law
Joey Woodard	Tennessee Stream Mitigation Program
Greg Young	Stites and Harbison

3. Meeting Process

MEETING SCHEDULE

The Committee met four times over a period of five months to discuss NAI and floodplain management in Metro. The meeting dates and locations were as follows:

- January 18, 2011, Main Nashville Public Library
- February 22, 2011, MWS Biosolids Building
- March 29, 2011, MWS Biosolids Building
- May 10, 2011, MWS Biosolids Building

NASHVILLE’S PEER CITIES

At their first meeting, the Committee was presented with floodplain regulations currently enforced in municipalities that are similar in size to Metro Nashville. These municipalities were selected because their floodplain management programs meet or exceed the basic FEMA floodplain regulatory requirements. These municipalities and a short description of the basis of their selection are shown in **Table 2**. These cities were used by the stakeholders as a basis for comparison for Metro.



Name	Reason Chosen
Tulsa, OK	Instituted a progressive floodplain management program following a significant flood event in the 1970s. A national leader in home buyouts and construction of major flood control facilities. Tulsa has the best rating in the nation in the FEMA Community Rating System (CRS).
Austin, TX	Southern community with similar topography and riverine systems. Similar size community with major river (Colorado River) flowing through downtown. Austin has been an experienced national leader in flood warning systems for more than 20 years.
Louisville, KY	Similar size community with major river (Ohio River) flowing through downtown. Developed extensive floodwall system to protect downtown businesses from floods on the Ohio River. Has developed watershed master plans that integrate water, sewer, and stormwater concerns.
Charlotte, NC	Southern community with similar topography and riverine systems. Recognized for having a well-balanced stormwater program. Like Nashville, Charlotte focused initial efforts on repair and construction for minor drainage systems. Today, their attention has shifted to neighborhood-wide drainage projects and stream restoration.

STAKEHOLDER DEFINED ISSUES

The Committee was asked to identify their priorities for the floodplain regulatory focus. A list of items was generated and the committee was asked to rank their importance. Each member was allowed to vote for five floodplain management discussion topics. The results of this process are shown below in **Table 3**.

Floodplain Issue	Votes Received
Incentives for redevelopment and/or smarter floodplain development projects	10
Floodplain disturbance or stream modification by property owners	6
Major floodplain Capital Improvement Projects (CIPs)	6
Floodwater detention and storage (regional/site) design criteria	5
Property owner education	5
Buffer regulations on unstudied streams	4
Coordination of regulations with other communities	3
Outdated floodplain delineations	2
Regulations regarding home location verses property location in regards to floodplain location	2
Stream bank erosion	1
Changing floodplain limits	1
Flexibility in floodplain regulations	1
Location verses elevation	0
Unstudied streams	0

GROUPING AND CATEGORIZATION

The Committee's suggestions were refined into precise topics and divided into two categories:

1. Regulatory items and policies that physically impact flooding and therefore address the charge of the Ordinance:
 - Building Location vs. Parcel Location
 - Building Location vs. Building Elevation
 - Changing Floodplain Delineations
 - Detention Criteria
 - Modification of Floodplains
 - Streams Without Defined Floodplains
 - Outdated Floodplain Delineations
 - Upstream Community Impacts

2. Other topics that impact the overall floodplain management program:
 - Stream bank Erosion
 - Flexibility of Regulations
 - Need for Capital Improvement Projects
 - Property Owner Education
 - Incentives for Smarter Development
 - Buffer Regulations

It was decided that the stakeholder group should focus primarily on items in the first category to better fit the charge of the Ordinance.

DISCUSSION TOPICS

The items required under the Ordinance and those suggested by the Floodplain Working Group were then distilled into five topic areas to be discussed during the three remaining stakeholder meetings. These are shown in **Table 4**.



Table 4. Stakeholder Meeting Discussion Topics	
Topic	Sub-topics
Building Location	Floodway (FW)
	Floodplain (FP)
Floodplain Disturbance	Cut and Fill
	Basements
Structure Elevation	Regulatory Floodplain
	Changes to Floodplain over time
	First Floor Elevations (FFE) referenced to base flood elevation (BFE)
	Residential versus non-residential criteria
Detention	Criteria
	Limits of Analysis
Floodplain Limits	Requirements when current floodplain does not exist
	Extending studies beyond FEMA limits
	Requirements for buildings outside the floodplain

4. Committee Discussions and Recommendations

Committee members were directed to focus on the following questions when discussing each topic:

- Are Metro’s current regulations appropriately targeted for the Council-mandated “no adverse impact” requirement?
- How should they be adjusted or changed?
- What other policies can Metro implement to improve the overall floodplain program?

KEY ISSUES & CURRENT POLICIES

Building Location - Are Metro’s current floodway and floodplain development regulations adequate?

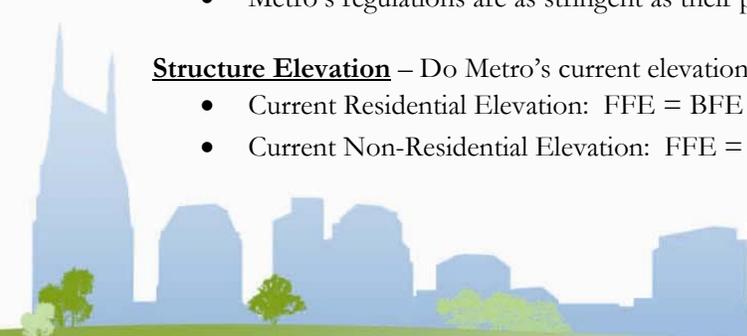
- 11,000 buildings were reportedly damaged in the May 2010 flood, approximately 3,000 of which were located outside of the floodplain.
- Development in the floodway is currently prohibited in Metro.
- Development in the floodway fringe (the area outside of the floodway that is within the floodplain) is currently allowed in Metro with restrictions.

Floodplain Disturbance – Are Metro’s current regulations that require balanced cut and fill within the floodplain appropriate?

- A professional engineer must certify that cut and fill volumes in the floodplain are balanced through the submittal of an as-built drawing.
- Metro’s regulations are as stringent as their peer cities.

Structure Elevation – Do Metro’s current elevation regulations adequately protect structures from flooding?

- Current Residential Elevation: $FFE = BFE + 4$
- Current Non-Residential Elevation: $FFE = BFE + 1$



- Metro’s residential elevation requirement is stricter than that of its peer cities.
- Some BFEs for Metro are outdated.
- Many peer cities use Full Build Out (FBO) +1 ft.
 - FBO BFEs account for future development in the watershed and therefore should not change theoretically over time as development occurs.
 - In Nashville a FBO assessment would be most pertinent in watersheds still undergoing development, such as Mill Creek and the Harpeth River.

Detention – Do Metro’s current detention regulations meet the council-mandated NAI?

- Metro and its peer cities require post-development peak flows to equal pre-development levels or detention is required.
- Currently, developers are required to check the next two downstream structures for adequate capacity.
- Metro utilizes Watershed Master Plans to regulate detention requirements in some areas. (Note: A Master Plan is a comprehensive plan based on modelling data that specifies different stormwater management requirements for different areas within a watershed.) Most of these plans were developed in the 1990s.
- Metro allows projects to utilize the 10% rule to assess impacts of their development at a defined distance downstream to determine if detention is required.

Floodplain Limits – Should FFE requirements extend to structures adjacent to the floodplain or where no floodplain is defined?

- Some structures on properties adjacent to floodplain properties are not required to elevate to BFE+4 feet for residential or BFE+1 foot for non-residential. As a result, they could be constructed at a lower elevation than a nearby structure (within the floodplain/built per FFE requirements) and be more prone to flood.
- Current policy requires a developer to define a floodplain if the contributing drainage area is greater than 640 acres (1 square mile). Many structures are located upstream of where a floodplain is defined and are therefore not required to elevate per FEE requirements.
- Master plans could be developed to identify floodplains upstream of areas currently delineated and could be used for setting FFE.

COMMITTEE RECOMMENDATIONS

Development in the Floodway

- The Committee decided Metro’s current policy was appropriate.

Development in the Floodplain

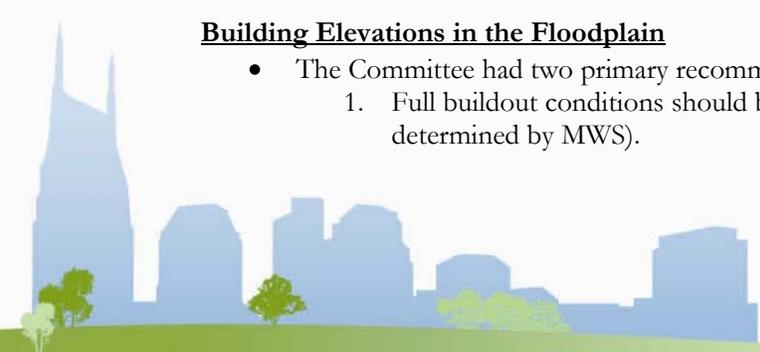
- The Committee decided Metro’s current policy was appropriate.

Cut and Fill Regulations

- The Committee decided Metro’s current regulations were appropriate.

Building Elevations in the Floodplain

- The Committee had two primary recommendations:
 1. Full buildout conditions should be used to set FFEs (FFE = FBO + an appropriate amount as determined by MWS).



2. Small retail businesses should be afforded protections more like residential than non-residential.

Detention Criteria

- The Committee offered a number of recommendations pertaining to detention policy:
 1. Stormwater master plans should be developed where non-existent and should be updated periodically.
 2. Stormwater master plans should be used in the land use planning process.
 3. Stormwater master plans should be developed and/or updated coincident with the 14 Sub-Area Plans where possible.
 4. Where stormwater master plans do not exist, detention requirements should be strengthened to insure no adverse impacts downstream.
 5. MWS should consider regional detention facilities where feasible, beneficial, and cost-effective for both developers and Metro.

Building Elevations Outside the Floodplain

- The Committee recommended that homes and businesses located proximate to but outside the floodplain should be elevated to either BFE + some freeboard or to the 500 year flood elevation. The amount of freeboard was not definitive but BFE+1 was discussed as a reasonable option.

Protection Where no Floodplain Exists

- The Committee did not make any definitive recommendations.

5. Overall Recommendations

Based on the Committee's recommendations, discussions between the consultant team and MWS staff, and feedback from other departments, MWS will integrate the following recommendations into their future floodplain policies and regulations:

1. Full buildout conditions should be developed for all watersheds where continued development is anticipated to significantly raise the floodplain elevation and used to set appropriate FFEs.
2. In watersheds where full buildout conditions are not determined or are unlikely to differ significantly from current floodplain elevations, MWS should continue to require that the FFE of residential buildings be 4 feet above the BFE and the FFE of non-residential buildings be 1 foot above BFE.
 - MWS should consider a protocol to identify small retail businesses and increase their level of flood protection.
3. Currently, both the Federal Emergency Management Agency (FEMA) and the U.S. Army Corps of Engineers (USACE) have ongoing studies which will establish new flood elevations for many Davidson County streams.
 - MWS should obtain all models and supporting data for these studies for use by staff and local engineers.
 - MWS should identify streams and/or watersheds where these new studies were not performed and prioritize study updates.

4. MWS should develop or update master plans for all watersheds. MWS and Metro Planning should coordinate on the development of Sub-Area Plans and develop a protocol to incorporate stormwater management into the planning process.
 - MWS should develop, or update, individual stream studies and/or watershed master plans as appropriate in conjunction with the update of Sub-Area Plans.
5. MWS should modify the engineering analyses required for detention basins to include a hydrologic and hydraulic study of the downstream conveyance system to ensure that new development has no adverse impact on downstream properties.

To apply the standard of no adverse impact, MWS will need to establish the following:

- The benchmarks for determining no adverse impact in terms of velocity, discharge, and/or flood elevations.
 - The distance downstream of the detention facility that the engineering analyses must include.
6. If during the development of stream studies, watershed master plans, or the Sub-Area Plans, opportunities are identified for the effective use of regional detention rather than on-site detention, MWS should pursue this option. MWS should consider an in-lieu-of program to recover their cost.
 7. Along streams where floodplains are established, MWS should require that all new structures built adjacent to the floodplain be elevated to the same FFE as proximate structures inside the floodplain in order to provide a consistent level of flood protection.

