



# Technical Memorandum

To: Linda Loomis, Administrator

From: Lisa Buchli, PE  
Della Schall Young, PMP, CPESC

Date: April 12, 2018

Re: LMRWD Floodplain and Drainage Alteration Standard – What It Is and How It Affects Floodplain Development

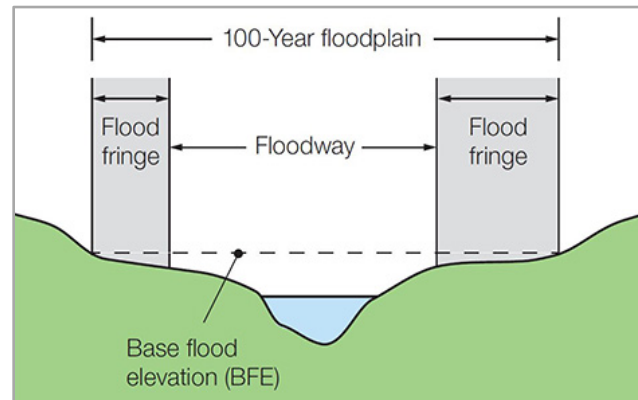
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The Lower Minnesota River Watershed District (“LMRWD” or “District”), as one of its management policies, regulates floodplain and drainageway alterations within its boundaries. Floodplains provide flood protection for natural resources, permanent structures, and private lands in accordance with Minnesota Statute 103F. The LMRWD ensures that protection through the Floodplain and Drainage Alteration Standard (hereinafter “District floodplain standard” or “standard”) that is a part of the District’s approved Watershed Management Plan, which is being amended. The amendment includes changes to the existing standard. This document provides a summary of the existing and proposed standards to help stakeholders better understand how the standard will affect them.

All communities within the District have floodplain ordinances that are approved by the Minnesota Department of Natural Resources (MnDNR). Adoption of those ordinances regulates floodplain activities unless the local government units (LGUs) have given the authority to the District. Proper floodplain management aims to minimize the risk from flood hazards. Some development within the floodplain may be allowed, but landowners are required to obtain the necessary LGU approvals before making alterations to floodplains of the Minnesota River, streams, and other bodies of water. If the proposed changes to the District’s floodplain standard are more restrictive than LGU’s current floodplain ordinance, the LGU will be required to adopt and enforce the new standard.

## **Floodplain Terminology**

The natural functions of river and stream floodplains are to carry or hold excess water during times of flooding, provide natural habitat, and protect water quality. The placement of fill or other obstructions within the floodplain has the potential to create channel restrictions and floodplain encroachments that impair its natural functions and amplify the tendency of the river to flood and cause damage. Figure 1 presents a simple representation of a floodplain system.



**Figure 1: Typical Floodplain Layout**

The definitions of several key terms follow:

**100-year flood** – the flood event having a 1 in 100 (or 1 percent) chance of being equaled or exceeded in any given year. Also referred to as the *1-percent annual chance flood* or *base flood*.

**100-year floodplain** – the area that will be inundated by the flood event having a 1 in 100 (or 1 percent) chance of being equaled or exceeded in any given year. Also referred to simply as *floodplain*.

**Base flood elevation (BFE)** – the water surface elevation during a 100-year flood. Also referred to as the *100-year flood elevation*, the *100-year water surface*, or the *1-percent annual chance flood elevation*.

**Floodway** – the stream channel and the portion of the adjacent floodplain that must remain open to permit passage of the base flood without cumulatively increasing the water surface elevation more than a designated height. FEMA<sup>1</sup> regulations

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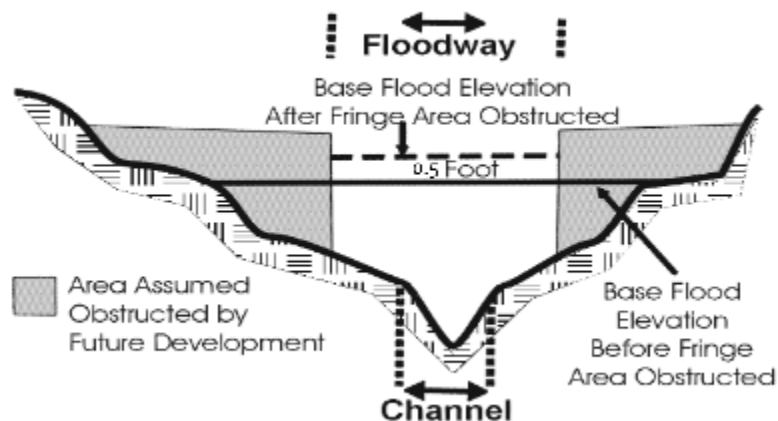
<sup>1</sup> The Federal Emergency Management Agency (FEMA) is the government agency responsible for coordinating the federal government's role in preparing for, preventing, and mitigating the effects of, responding to, and recovering from all domestic disasters, whether natural or man-made.

state that the designated height cannot be more than one foot. In Minnesota, this height is 0.5 feet.

**Flood fringe** – the remainder of the floodplain after the floodway has been determined. This area is generally associated with slow moving or standing water rather than flowing water.

### **How Is the Floodway Determined?**

A floodway analysis is conducted to determine the boundaries of the floodway. That analysis determines where encroachment by development will increase flood elevations significantly and worsen flood conditions. The analysis, conducted by computer using hydraulic modeling software, begins at both edges of the floodplain. The computer model starts “filling” the floodplain by adding obstructions on either side of the river cross section. That “squeezes” the floodwater toward the center of the channel and causes the flood level to rise. At the point where this process results in a 0.5-foot rise (in Minnesota), the floodway boundaries are drawn. That procedure is repeated at all cross sections in the hydraulic model. Figure 2 illustrates the floodway analysis process.



**Figure 2: Computer floodway analysis**

FEMA considers allowing flood heights to rise to a designated height to be a compromise standard. Prohibiting any rise in flood elevation would prohibit most types of new development or redevelopment. On the other hand, allowing development to obstruct flood flows and increase flood heights can create problems for other property owners. The floodway analysis procedure described above ensures that properties on both sides of a river will be treated equally so the degree of obstruction currently permitted for one property will be permitted in the future for the other.

Not all streams currently have mapped floodplains, and even fewer have mapped floodways. According to the National Hydrography Dataset, there are a little more than 3

million miles of streams in the United States. In 2013, just over a million miles of streams had mapped floodplains, and only 20 percent of those floodplains had mapped floodways. However, automated modeling and mapping tools are making floodplain studies less expensive. As more floodways in the district are mapped, it becomes more critical for the District to implement standards that will reduce the impacts of encroachments into the floodplain and minimize the potential for flood damage.

### **What Activity is Allowed in the Floodplain?**

No permanent structures, with the exception of drainage conveyance structures and monitoring equipment, may be constructed in the floodway. Because the floodway must be left open to pass flood waters, only open space uses such as farming, residential yards or gardens, golf courses, parks, playgrounds, or parking lots are usually allowed.

Based on the way the floodway/flood fringe boundary is determined, any development in the flood fringe would not increase flood levels more than what is allowed by Minnesota statute (0.5 feet). While the Minnesota standard does establish this upper limit, the LMRWD believes that allowing the designated height to be anything other than zero is problematic. As noted above, the method for developing floodway boundaries allows for a 0.5-foot water surface increase above the 100-year flood elevation. However, floodplain mapping is developed based only on the 100-year flood elevation. When the flood fringe is filled, the floodway constricts and flood elevations rise, so the area inundated by the same flood event increases. New development allowed within the flood fringe could cause existing development mapped just outside the 100-year floodplain to flood during a 100-year event. In addition, floodplain encroachments can be damaging to the natural and beneficial functions of the floodplain.

For those reasons, the existing District floodplain standard states that if the placement of fill in the 100-year floodplain causes a rise in the 100-year flood elevation, compensatory floodplain storage equal to or greater than the volume of placed fill must be provided. In essence, the standard requires no net loss of natural floodplain storage. The volume of the loss of storage due to filling or grading will be offset by providing an equal volume of storage by excavation. There will be no rise in the 100-year flood elevation because any rise due to placed fill or grading will be offset by excavation of material in another part of the floodplain.

The proposed District floodplain standard includes an additional requirement stating that no grading or filling is allowed in the floodplain if it reduces the flood-carrying capacity of the watercourse. That requirement was added to better align the standard with current federal and state regulations for FEMA-mapped floodplains. The requirement is intended to prevent, for example, grading in the floodplain that does not add fill but does create a new obstruction. There would be no change to the storage volume in the floodplain, but if the grading essentially created a dike perpendicular to the direction of

flow, it could cause an increase in the 100-year flood elevation by limiting flow conveyance. The addition to the District floodplain standard ensures that any floodplain development will not adversely affect flood flow efficiency or restrict the capacity of the flow.

### **Approval of Allowed Floodplain Activity**

If property owners or developers want to place fill or perform grading in the flood fringe, they will need to provide information showing that the proposed work would not cause a rise in the 100-year flood elevation. If it can be shown that any flood fringe volume that is filled would be offset by an equal volume of excavation elsewhere in the floodplain, modification to the hydraulic computer model that was used to create the existing floodplain mapping would not be necessary. The required fill and excavation volumes must be calculated by a professional engineer registered in the State of Minnesota. A No-rise Certification, while not necessary, also would meet this requirement. This will help to ensure that new development that is allowed within the floodplain will not increase flooding on any existing development.

### **Summary of Changes to the District Standard**

The existing floodplain alteration standard (from the Third Water Management Plan of 2011 with 2015 amendments) requires that no filling be allowed in the floodplain that causes a rise in the base flood elevation without providing compensatory floodplain storage. That requirement is included in the proposed standard as well, along with the requirement that the allowable fill area must be calculated by a professional engineer registered in the State of Minnesota. The proposed standard also states that the floodplain storage capacity that will offset the proposed fill must be created before any fill is placed in the floodplain.

A new requirement added to the standard states that no grading or filling is allowed in the floodplain if it reduces the flood-carrying capacity of the watercourse below the base flood elevation. As stated previously in this document, this regulation was added to better align the standard with current federal and state regulations for FEMA-mapped floodplains. The conveyance capacity must be calculated by a professional engineer registered in the State of Minnesota, and the analysis must show no decrease in conveyance upstream and downstream of the proposed fill or grading.

The proposed standard states that all new residential, commercial, industrial, and institutional structures must be constructed so the lowest floor of the lowest enclosed area (including a basement or crawl space) is at least two (2) feet above the base flood elevation. This is a change from the existing standard, which states that the “lowest

ground level” must be two feet above the base flood elevation. That change was made to better align the standard with current federal and state regulations.

The proposed standard includes a new regulation related to dredging projects. Fill can be temporarily placed in the floodway for staging or processing of river dredge material as long as the dredging is conducted according to a cooperative or local sponsorship agreement with the United States under the Rivers and Harbors Act and it meets the requirements of the LGU.

A final change to the proposed standard is the inclusion of an exception to the rules outlined in the standard. If the base flood elevation of a waterbody is entirely within a municipality, the waterbody does not outlet during the base flood, and the municipality has adopted a floodplain ordinance prescribing an allowable degree of floodplain encroachment, the municipality’s ordinance governs the allowable degree of encroachment.

CC: Jeffrey Thuma, Burns & McDonnell