
ARTICLE 6: FLOOD PROTECTION AREAS

Introduction

Flood Protection Areas (FPAs) are generally natural topographic and/or vegetated areas that provide water quantity benefits that are important components of **watershed** management. Under the WMO, **FPAs** include **floodplains, floodways, wetlands, wetland buffers, and riparian environments**.

FPAs provide a variety of functions, including **sediment** filtering, bank **stabilization**, water/**floodplain** storage and release, and aquifer recharge. In addition, **FPAs** can provide important habitat for wildlife.

FPAs are regulated by state and federal agencies. The **Illinois Department of Natural Resources - Office of Water Resources (OWR)** regulates activities in the **regulatory floodway**. The **Federal Emergency Management Agency (FEMA)** administers the **National Flood Insurance Program (NFIP)** in **regulatory floodplains** and **regulatory floodways**. The **US Army Corps of Engineers (Corps)** regulates waters of the US, including **wetlands**, and to some degree **wetland buffers**, which may also be located within **riparian environments**.

The WMO provides standards for **development** that meet, or in some instances exceed, the State **floodway** requirements as administered by the **OWR** and the **wetland** permitting requirements administered by the **Corps**. WMO regulations do not supersede or replace the authority of the **OWR** or the **Corps** to administer or issue permits for **development** under their jurisdiction. Prior to construction within a **FPA**, applicants must secure all appropriate permits or approvals from these agencies. For certain activities in the **floodway** and **wetlands**, the **OWR** and the **Corps** have issued Statewide and Regional Permits. Where **developments** meet the general or specific conditions of Statewide or Regional Permits, the appropriate documentation must be submitted to the **District** or an **authorized municipality** prior to issuance of a WMO permit.

Additionally, while the WMO meets, and in some instances exceeds, the minimum technical requirements of the **NFIP** for **development** in the **floodplain**, not all administrative requirements are specifically addressed. For example, the requirement and standard for elevating a **building** in the **floodplain** that has been substantially improved is included in the WMO. However, the administrative requirement to determine if an improvement is a **substantial improvement** is the responsibility of the **NFIP** community and may include activities that do not affect **stormwater**, such as internal remodeling or exterior improvements such as siding and windows.

<p>Note: All bold terms contained in this document are defined terms in the WMO. Refer to Appendix A of the WMO or the TGM for the definition of each bold term.</p>

REQUIREMENTS FOR FLOODPLAINS AND FLOODWAYS (§601)

Introduction

Floodplain management is a critical component of **watershed** management and is defined as the regulation of activity or **development** in the **floodplain**. For the purposes of the WMO, the **floodplain** is the area adjacent to and including a body of water where ground surface elevations are at or below the **100-year flood elevation**. The 100-year **flood** event represents a **flood** that has a one percent chance of occurring in any given year, and is also known as the “1% annual chance **flood**” or “**base flood**.” The **100-year flood elevation** is commonly referred to as the **Base Flood Elevation (BFE)**.

Floodplain management consists of the regulation of **floodways**, **flood** fringe areas, and **site-specific** or **depressional storage** areas. **Floodplain** standards define appropriate activities allowed in the **floodplain** and describe how these activities must be constructed to protect people and property from **flood** damage.

The WMO establishes general standards for **development** activities in the **floodplain**. The WMO in §601.1 states that **development** within **floodplains** shall not:

1. “Result in any new or additional expense to any **person** other than the applicant for **flood** protection or for lost environmental stream uses and functions;
2. Increase **flood** elevations by more than 0.1 ft or decrease **flood** conveyance capacity upstream or downstream of the area not under the **ownership** or control of the applicant;
3. Increase **flood** velocities by more than 10% or result in an impairment of the hydrologic and hydraulic functions of streams and **floodplains** unless a **water resource benefit** is realized;
4. Violate any provision of this **Ordinance** either during or after construction; and
5. Unreasonably or unnecessarily degrade surface or ground water quality.”

All activities in the **floodplain** that meet the WMO definition of **development** require a **Watershed Management Permit**. The WMO defines **development** as:

“Any human-induced activity or change to real estate (including, but not limited to, grading, paving, excavation, dredging, fill, or mining; alteration, subdivision, change in land use or practice; **building**; or storage of equipment or materials) undertaken by private or public entities that affects the volume, flow rate, drainage pattern, or composition of **stormwater**, or the **substantial improvement** of an existing **building** in a **Special Flood Hazard Area (SFHA)**. The term **development** shall include **redevelopment** and shall be understood to not include **maintenance**.”

The WMO and the National Flood Insurance Program

National Flood Insurance Program Eligibility (WMO §206)

1. The WMO does not repeal any municipal ordinance or resolution passed in order to establish eligibility for the National Flood Insurance Program (NFIP).
2. The WMO is not intended to supplement, replace, or remove any responsibility that a municipality may have to maintain eligibility and good standing in the NFIP. Proper administration and enforcement of the NFIP within participating municipalities is a requirement of the NFIP.
3. Floodplain requirements meet or exceed the NFIP requirements for development as defined by Article 6 of the WMO.

Note:

Refer to the actual language contained in the NFIP Floodplain Management Regulations at Title 44 Code of Federal Regulations (CFR) Part 59 and 60 for municipal requirements for the administration and enforcement of the required NFIP minimum criteria.

Identifying Regulatory Floodplain

The **National Flood Insurance Program (NFIP)** was established in 1968 to promote responsible **floodplain** management to reduce future **flood** damages and to offer **flood** insurance to individual property **owners**. The **Federal Emergency Management Agency (FEMA)** began publishing **Flood Insurance Rate Maps (FIRMs)** to show the locations of **flood** zones in relation to specific properties. Since **FEMA** began publishing **FIRMs** in the early 1970's, the maps have been updated and revised to include the various **flood** studies that have been completed over the years. At the time of this publication, the most recent **FIRMs** for **Cook County** have a revision date of August 19, 2008. Both historical and effective **FIRMs** can be viewed on-line through **FEMA's** website at: <https://msc.FEMA.gov/>. A complete listing of all **FIRM** maps in **Cook County** is provided in Appendix B of the **TGM**.

FIRMs provide the locations of various **flood** zones in relation to specific properties. Each **FIRM** contains a legend that designates the different types of **flood** zones and their characteristics. The maps also include other useful information such as the limits of the **regulatory floodway**, municipal boundaries, and benchmarks. The **regulatory floodplain** is shown on the **FIRM** as a **SFHA**, and in Illinois all **SFHAs** have Zone "A" designations. **Flood** zones with the "A" designation are areas with a one percent chance of **flooding**, however, a **BFE** may or may not be established by **FEMA**.

A listing of applicable Zone A **floodplains** is shown in Table 6-1. Any Zone A areas shown on a **FIRM** are considered to be **regulatory floodplain** areas. Descriptions of other common **FIRM** zones are also included in the table.

Table 6-1. FIRM Zone Descriptions

FIRM Zone	Description
AE, A1-A30	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. In most instances, BFEs derived from detailed analyses are shown at selected intervals within these zones.
AH	Areas with a 1% annual chance of shallow flooding , usually in the form of a pond, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. BFEs derived from detailed analyses are shown at selected intervals within these zones.
AO	River or stream food hazard areas and areas with a 1% or greater chance of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Average food depths derived from detailed analyses are shown within these zones
A	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas, no depths or BFEs are shown within these zones. Since no BFE has been established, the applicant must determine an elevation using a site-specific floodplain study by a professional engineer using appropriate hydrologic and hydraulic models. This is discussed in further detail in this document.
AR	Areas with a temporarily increased food risk due to the building or restoration of a food control system (such as a levee or a dam). Mandatory food insurance purchase requirements will apply, but rates will not exceed the rates for unnumbered A zones if the structure is built or restored in compliance with Zone AR floodplain management regulations.
A99	Areas with a 1% annual chance of flooding that will be protected by a Federal food control system where construction has reached specified legal requirements. No depths or BFEs are shown within these zones.
X	Areas outside the 1-percent annual chance floodplain , outside of the 1% annual chance sheet flow flooding where average depths are less than 1 foot, and outside the areas of 1% annual chance stream flooding where the contributing drainage area is less than 1 square mile, or areas protected from the 1% annual chance food by levees. No BFEs or depths are shown within these zones. Food insurance is not required in these zones and no floodplain permit is required from MWRD.
D	Areas in which food hazards are undetermined, but possible.

The AE, A1-A30, AH, AO, A, AR, and A99 areas described in the table above are often referred to as the 100-year **floodplain**. Following the passage of the **Flood** Disaster Protection Act of 1973 and the National **Flood** Insurance Reform Act of 1994, the purchase of **food** insurance is mandatory for any federally backed mortgage on a **building** located in a **SFHA**.

Regulatory Floodplain and BFE Determination

Although the limits of the **regulatory floodplain** are shown on a **FIRM**, a more accurate location of the **regulatory floodplain** is possible by delineating the **BFE** on the project-specific topography. Because **FIRMs** round the **BFE** to the nearest whole foot, it is necessary to consult the **Flood Insurance Study (FIS)**, which provides **food** profiles to the nearest 0.1 foot. Therefore, to accurately identify the limits of the **regulatory floodplain** on a project **site**, a combination of the information provided on the **FIRM** and in the **FIS** must be used.

In addition to the **flood** profiles, the **FIS** contains other useful information such as the hydrologic and hydraulic computer models used in **floodplain** studies, **floodway** data tables, and **flood** profiles. It also contains an inventory of any **Letters of Map Change (LOMC)** that have been issued by **FEMA** for the County. The **Cook County FIS** can be viewed on-line through **FEMA's** website using the following link: <https://msc.FEMA.gov/>.

Map zones are designated on the **FIRM** and are described in the map's legend. As stated in the WMO, the determination of the **BFE** in **SFHAs** shown on the **FIRM** associated with the effective **FIS** shall be determined for:

1. AE Zones by using the 100-year profile at the **development site**, which is taken from the **FIS**;
2. AH Zones by using the elevation noted on the applicable **FIRM**;
3. AO Zones by using the **highest adjacent grade** plus the depth number shown on the applicable **FIRM**, or two feet above the **highest adjacent grade** if no depth number is provided; and
4. Areas shown as A Zones on the effective **FIS**, a **BFE** shall be determined by a project-specific **floodplain** study approved by the **District**. This study shall be approved by **OWR** in cases where both:
 - a. The **drainage area** is one square mile or greater; and
 - b. The **development** is associated with a permit that will be issued by **OWR**.

When a known **flood** hazard is not shown on the **FIRM** as an **SFHA**, the **District** or an **authorized municipality** may require the applicant to perform a project-specific **floodplain** study to determine the **BFE**. For these cases, the requirements outlined in (4) above will also apply.

Project Specific Floodplain Studies

The **District** may require a project-specific **floodplain** study to determine the project-specific **100-year flood elevation** (§601.5). The reasons for a project-specific **floodplain** study may include, but are not limited to, the following:

1. Areas that are mapped as **SFHAs** on the **FIRM** but contain no associated **flood** elevation. The project-specific study will provide both the limits of the **floodplain** and **floodway** and will serve as best available information until a **regulatory floodplain** and **floodway** are established. If the **tributary area** to the **site** is one square mile or greater, the study shall also require approval from **OWR** or their designee;
2. Areas that are known to **flood**, but where there is no **SFHA** shown on the **FIRM**. The project-specific **floodplain** study will be used to determine the extent of the **floodplain** to ensure that new **structures** are built to withstand **flooding** and to ensure that no

damage is caused to existing **buildings** as a result of new **development**; and

3. Areas where the **floodplain** maps are known to incorrectly delineate the **floodplain** elevations.

For the above situations, the project-specific **floodplain** studies need to be approved by **OWR** in cases where both:

1. The **drainage area** is one square mile or greater; and
2. The **development** is associated with a permit that will be issued by **OWR**.

Also, when a project-specific **floodplain** study is required, hydraulic and hydrologic analysis must be completed utilizing an approved methodology such as those outlined in §601.6 of the WMO, including:

1. TR-20, HEC-1, or HEC-HMS hydrologic model; and
2. HEC-2 or HEC-RAS hydraulic model.

Hydrologic Models

TR-20 is a DOS-based hydrologic modeling computer program that was developed by the Soil Conservation Service (now named the **Natural Resources Conservation Service**). TR-20 is a physically-based **watershed** scale **runoff** event model that is based on the Soil Conservation Service (SCS) Technical Release (TR-55) methodology. It computes direct **runoff** and develops hydrographs resulting from any synthetic or natural rainstorm. Developed hydrographs are routed through stream and valley reaches as well as through reservoirs. Hydrographs are combined from tributaries with those on the main stream stem. Branching flow (diversions) and baseflow can also be accommodated. The TR-20 hydrologic modeling software is available for download on-line at:

<http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/null/?cid=stelprdb1042924>

A windows-based version of the software (Win TR-20) has also been developed and can be downloaded on-line at:

<https://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/water/manage/hydrology/>

HEC-1 and HEC-HMS hydrologic modeling computer programs were developed by the **Corps**. These programs offer the same capabilities as TR-20, but provide additional methodologies for the generation of **runoff** and hydrograph routing. HEC-HMS is the windows-based version of the software and supersedes the original DOS-based HEC-1 software. Both programs are acceptable to use in hydrologic analyses, however, HEC-1 and HEC-HMS must be used in conjunction with the SCS **runoff** method. The programs are available for download on-line at:

<http://www.hec.Corps.army.mil/software/>.

Hydrologic Modeling Procedure

If flowrates for a **waterway** have been established in the **FIS**, or have been certified by **OWR**, the applicant may use these flowrates instead of performing a detailed hydrologic analysis of the **waterway**. If there are no established flowrates, or if **watershed** conditions have changed which render the established flows obsolete, then the applicant must perform a detailed hydrologic analysis to define flowrates through the project **site**. Utilizing one of the approved hydrologic models from the previous section, a hydrologic analysis must be performed using the following guidelines:

- The modeling should assume an average Antecedent Moisture Condition (AMC) of 2 for the **watershed**.
- The **Bulletin 70** rainfall depths provided in Table 5-6 of the **TGM** must be used in conjunction with the appropriate Huff rainfall distributions (Table 5-5).
- The analysis should include the 1-, 2-, 3-, 6-, 12-, 18-, 24- and 48-hour storm durations to determine the critical storm duration for the **watershed**.
- Where available, the hydrologic model should be calibrated to gaged data for the **watershed**.

Hydraulic Models

Both HEC-2 and HEC-RAS are water surface profile programs developed by the **Corps**. The HEC-RAS software, which performs one-dimensional steady and unsteady flow river hydraulic calculations, supersedes the DOS-based HEC-2 software, which calculated water surface profiles for one-dimensional, steady flow conditions. These programs compute water surface profiles for both subcritical and supercritical flow conditions, and have the ability to analyze the effects of bridges, culverts, flow obstructions, inline weirs, lateral **structures** and other **structures** that influence river hydraulics. These models were also designed for applications in **floodplain** management and **flood** insurance studies to evaluate **floodway** encroachments. Both HEC-2 and HEC-RAS are acceptable hydraulic modeling software, and are available for download on-line at:

<http://www.hec.Corps.army.mil/software/>

Since technologies are constantly improving and new models are being developed, there may

be additional methods available for modeling purposes. Alternative methodology must be approved by the **District** and by **OWR**, as applicable, prior to submitting for a permit.

Hydraulic Modeling Procedure

By utilizing either established flowrates or flowrates obtained through a detailed hydrologic analysis, the water surface profiles for a **waterway** can be established by using one of the hydraulic models approved by the WMO. An existing (without project) conditions hydraulic model should be developed to determine the limits of the **floodplain** through the project **site**. A proposed (with project) conditions hydraulic model should also be developed to determine the impacts (if any) that the proposed project has on **flood** elevations.

Existing (Without Project) Conditions Model

A hydraulic model is developed based on project-specific survey data, which includes channel cross-sections and all hydraulic **structures**. The cross-sections should be drawn parallel to each other and perpendicular to **flood** flow, and should also extend beyond the limits of the 100-year **floodplain**. Roughness coefficients (Manning's n values) for the channel and overbank areas of each cross-section must be defined based on the types of vegetation and land use. The hydraulic model requires the user to define a downstream boundary condition, which is either a known water surface elevation (preferable) or the normal depth based on the average slope of the channel. The downstream boundary condition should be located sufficiently downstream so that it does not affect the onsite **flood** elevations (in most cases this will be less than 500 feet downstream). If the subject **waterway** is influenced by the backwater of a receiving stream, the downstream boundary condition should be adjusted accordingly.

The results of this model will serve as the existing (without project) conditions. This hydraulic model can become the regulatory model if it is approved by the community, **OWR** (if required), and **FEMA**.

Proposed (With Project) Conditions Model

This hydraulic model is developed based on the effects of the proposed **development** on the **waterway**. The cross-section geometries should reflect any **floodplain** cut or fill that results from the proposed **development**. If the **development** proposes roadway crossings, the new hydraulic **structures** should be included in the hydraulic model. The channel and overbank roughness coefficients should be adjusted to account for any changes to the onsite vegetation and land use. The proposed conditions model will determine the impacts that the proposed project has on the existing hydraulic conditions.

Letters of Map Change (LOMC)

The WMO requires all applicants to review the current **FIRM**, including any **LOMCs**, to determine if a **regulatory floodplain** is within the **development site**. **FIRMs** can be updated at any time by **FEMA**, and only **FEMA** can issue a revision to a **FIRM**. Because each **LOMC** is not necessarily updated on the **FIRMs**, the applicant must review all **LOMCs** issued in their area of **interest** to verify they are using the most up-to-date **FEMA** approved **flood** elevations. For this reason, the WMO states in §601.3:

*The current versions of the maps adopted and published by **FEMA** for regulation under the **NFIP** together with any amendments, additions, revisions, or substitutions adopted and published by **FEMA** at any time in the future are hereby referred to, adopted, and made part hereof, as if fully set out in the **WMO**.*

LOMCs can be viewed on-line from **FEMA**'s website at: <https://msc.FEMA.gov>.

Because **FIRMs** play such a critical role in effective **floodplain** management, the limits of the **SFHAs** are constantly being updated to reflect new and better information. Communities, engineers, homeowners, and developers may find it necessary to revise the **FIRMs** to reflect new information. A description of each type of **LOMC** is provided below.

Letter of Map Amendment (LOMA)

A **LOMA** is required when a single **structure** (or multiple **structures**) is inadvertently shown in the **SFHA**, but is built on natural high ground that is equal to or above the **BFE**. Certification by a **Professional Engineer** or **Professional Land Surveyor** is required so that the lowest adjacent grade (LAG) of the **structure** is at or above the **BFE**. When **FEMA** issues a **LOMA**, the **structure** is removed from the **SFHA**, but the **FIRM** is not actually revised to reflect it.

Letter of Map Revision (LOMR)

To officially revise the **regulatory floodplain** and **floodway** boundaries, a **LOMR** must be issued by **FEMA**. There are several cases that may require a **LOMR**, with the most common being:

- A **flood** study is developed for a Zone A (unstudied) area;
- A new **flood** study is developed that revises the regulatory **flood** study; or
- A **flood** control facility, such as a reservoir or levee, is constructed that revises the regulatory flowrates/**flood** elevations

When **FEMA** issues a **LOMR**, both **flood** elevations and **SFHA** boundaries are revised, but only for the affected area.

Physical Map Revision (PMR)

LOMR requests typically involve small areas of revisions, but if a large area of revision is requested, such as for an entire **watershed** study, it is easier for **FEMA** to re-issue the entire **FIRM** panel(s). When a **PMR** is issued, **FEMA** will physically reprint one or more **FIRM** panels that cover the area of revision.

LOMR-F

A **LOMR-F** request is to remove a **structure** or area of land from the **SFHA** through the placement of fill. The **LOMR-F** officially revises the limits of the **SFHA** based on the fill area, but it does not revise **flood** elevations or **floodway** boundaries (since fill is not allowed in the **floodway**).

CLOMR

A **CLOMR** is only required for proposed projects that either: (1) increase **flood** elevations by more than 0.1 foot, or (2) revise the **regulatory floodway** boundary. The purpose of the **CLOMR** is to verify that, if a proposed project is constructed as designed, it will revise **flood** elevations and/or **floodway** boundaries. Since a **CLOMR** is conditional, there is no map revision when it is issued. The official map revision would occur after as-builts are submitted and **FEMA** issues a **LOMR**.

In order to meet the minimum requirements of the **NFIP** and the **OWR floodway** regulations, the WMO requires certain **LOMCs** to be obtained prior to construction in the **FPA**:

1. All **CLOMR**, **LOMR**, and **LOMR-F** applications must have the approval of the governing **municipality** and must be submitted to the **District** concurrently with the application to **FEMA** (§602.15);
2. Filling, grading, dredging, excavating, or other proposed **development** within the **regulatory floodplain** is prohibited if the proposed activity will create an increase to the **FIS** effective **BFE** or a modification to the **regulatory floodway** boundary, until a **CLOMR** is issued by **FEMA** and a **floodway** construction permit is issued by **OWR** (§602.16); and
3. If a **LOMR** is required by **FEMA**, then **building** construction shall not take place until the approved **LOMR** is received (§602.17).

Examples for Determining the BFE, the Flood Protection Elevation (FPE), and Limits of the Regulatory Floodplain

Example 1: SFHA Shown on FIRM and BFE Established

BFE = 100-year flood elevation taken from **FIS flood** profile

FPE = **BFE** + 2 feet

Regulatory Floodplain = **BFE** delineated on **site-specific** topography

Example 2: SFHA Shown on FIRM, BFE Determined in the FIS and an LOMC Issued

BFE = 100-year flood elevation taken from issued **LOMC**

FPE = **BFE** + 2 feet

Regulatory Floodplain = **BFE** delineated on **site-specific** topography

Example 3: SFHA Shown on FIRM and No BFE Established

BFE = 100-year flood elevation from project-specific **floodplain** study

FPE = **BFE** + 2 feet

Regulatory Floodplain = **BFE** delineated on **site-specific** topography

Example 4: SFHA NOT Shown on FIRM, No BFE, and District Requires a Project-Specific Study

BFE = 100-year flood elevation from project-specific **floodplain** study

FPE = BFE + 2 feet

Regulatory Floodplain = BFE delineated on **site-specific** topography

In this situation it is important to note that all WMO and **NFIP** requirements apply throughout the **SFHA**.

Identifying Regulatory Floodway

The **floodway** is the portion of the **floodplain** adjacent to a stream or watercourse that is needed to convey the **base flood** without cumulatively increasing the water surface elevation more than 0.10 foot. Water within the **floodway** is often the deepest and swiftest. Protecting this area is critical because **development** within it may result in potentially damaging increases in **flood** stage and **flood** velocities. In accordance with Illinois law, **development** in the **regulatory floodway** is limited to **appropriate uses** and is under the jurisdiction of the **OWR**.

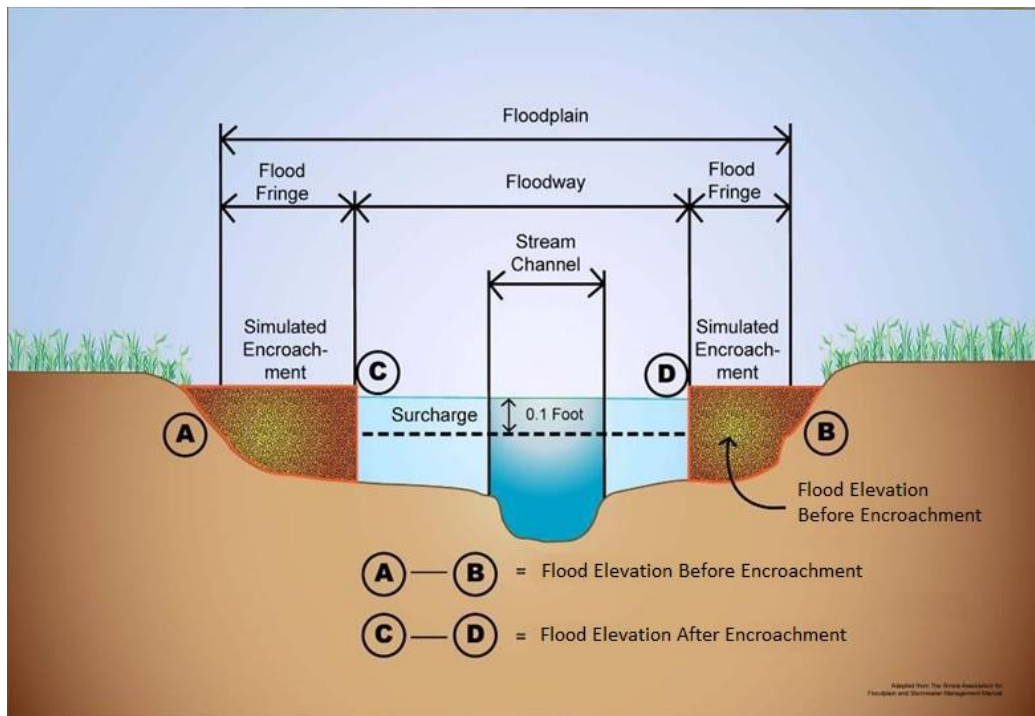


Figure 6.1. Floodplain, Floodway, and Stream Channel Cross-section

The limits of the **regulatory floodway** must be determined for each **development site**. Designated **regulatory floodways** are shown as cross-hatched areas on the effective **FIRM**. To locate the **regulatory floodway** boundary on a project **site**, the **floodway** should be scaled off the **regulatory floodway** map and located on a **site** plan using reference marks common to both maps. These reference points should be fixed objects common to both the **floodway** map and the **site** plan such as roadways, bridges, and section lines. Unlike the **regulatory floodplain**, which is delineated based on project-specific topography, the **regulatory floodway** widths for a

project **site** should be identical to the **regulatory floodway** widths shown on the **FIRM**. Where interpretation is needed to determine the exact location of the **regulatory floodway** boundary, the **District** or an **authorized municipality** should be contacted for the interpretation.

In some instances, a cross-section from the **FIS** may be located on the property. For that specific location, it is not necessary to scale the **floodway** limits. The applicant may refer to the **Floodway** Data Tables found within the **FIS**. The cross-section number should be determined from the **FIRM** and then located within the **FIS**.

Designating a Regulatory Floodway

The **floodway** is established using the hydraulic computer model that was used to establish the **floodplain**. The **floodplain** is artificially encroached upon until a certain threshold is reached. Per **OWR** Part 3708 Rules, encroachments are made to the **floodplain** until one of the following criteria is met:

- 0.10-foot increase in the **100-year flood elevation**;
- 10% reduction in storage volume; or
- 10% increase in flow velocities.

When one of these thresholds is met, the **floodway** boundaries have been established. Figure 6.1 illustrates the encroachment of a **floodplain** to define the **floodway**.

Regulatory Floodway Not Designated

The **FIRMs** may show **SFHAs**, but the **floodway** may not be designated or depicted. This is also the case for those projects where no **SFHA** is defined, but a **site-specific floodplain** study is required. If a **floodway** has not been designated, requirements are based on the **drainage area** of the **development site** and upstream areas:

1. If the **drainage area** is greater than one square mile to any portion of the **site**, **regulatory floodway** is determined to be the limits of the **regulatory floodplain** (§601.7.A). All provisions related to **regulatory floodway**, with the exception of the **appropriate use** criteria, would apply.
2. If **floodplain** is not designated on the **Cook County FIRM** but the tributary **drainage area** is greater than one square mile to any portion of the **site**, the applicant is required to complete a **site-specific floodplain** study to establish the 100-year **floodplain** through the **site**. **OWR** concurrence would be required for the **site-specific floodplain** study, however, it is not necessary for the applicant to designate the **floodway**. The provisions referenced in (1) above would apply.
3. If the **floodway** is not designated on the **Cook County FIRM** and the tributary **drainage area** to all portions of the **site** is less than one square mile, **floodway** designation is not required (§601.7.B); only **floodplain** provisions of the WMO would apply.

Re-Designating a Regulatory Floodway

Flood elevations generated by the regulatory model must first be duplicated before updated data is input into the model to reflect the existing conditions. The **flood** profiles, flows, and **floodway** data in the **regulatory floodway** study must be used for analysis of the regulatory conditions. If the study data appears to be in error or conditions have changed, the **OWR** or its designee shall be contacted for approval and concurrence on the appropriate existing conditions data to use. Once the output of the regulatory model has been duplicated to within 0.10 foot of the regulatory profile, revisions should be input to reflect the modified-existing conditions.

Duplicate Effective Model

Whether or not a revision to the **regulatory floodway** conditions is desired, the first step is to duplicate the regulatory profile using the same hydraulic model. Data input into the duplicate model should be identical to the data generated by the regulatory profile. It is not necessary to duplicate the entire regulatory profile but the applicant should start the profile at least four cross-sections downstream of the project **site**. Once the input from the regulatory model has been duplicated, the output of the duplicate model should be verified against the output of the regulatory model. A copy of the regulatory profile should be submitted along with the duplicate model run as part of the permit application package. The discharges from the regulatory model shall be used except where the **District** or an **authorized municipality** requires new discharges. The necessity for new discharges will depend on the correlation between the existing conditions profile, the regulatory profile, and the magnitude of the impacts on the profile due to the project. If the existing conditions profile is calculated to be lower than the regulatory profile, the effects of lost storage must be analyzed and the new hydrologic analysis must reflect the future land use. The applicant may contact the **District** or an **authorized municipality** for an opinion on the suitability of the regulatory discharges. New discharges shall be developed based on the methodologies outlined in Article 5 of the **TGM**. Where there is a designated **floodway** mapped, but there is no computer model available, the engineer should consult the **District** about how to proceed with the specifics of modeling the existing conditions. Whenever new discharges are determined, they should be submitted to the **OWR** for concurrence. The certified discharges form is available on-line through the **OWR's** website at:

http://www.dnr.illinois.gov/WaterResources/Documents/DischargeCertification_Live_Form.pdf

Corrected Effective Model

Once the duplicated model has been prepared and is operational, the model must be updated to create a model based upon the existing conditions, in order to do a comparison against the proposed conditions hydraulic model. Cross-sections should be added to the effective model where it is appropriate to add them for both the existing and with project hydraulic analyses. The existing conditions model should include all corrections to the regulatory profile and should be modeled with attention to areas of ineffective conveyance. The applicant is responsible for all existing field conditions within the **watershed** which may affect the existing conditions hydraulic model. These areas can be maintained in the model for storage volume and area

calculations by inputting an artificially high n-value for these areas (such as 99). This will cause the computer model to treat these areas as ones of ineffective flow, but the cross-sectional area is still maintained for the area and volume calculations. Ineffective flow areas should be clearly annotated on the plans and cross-sections.

The existing conditions profile must tie in to the regulatory profile to within 0.5 feet, based on **FEMA** requirements, upstream and downstream of the project reach. Where it is not possible to meet the regulatory profile, a new **hydrology** study will need to be prepared.

With Project Conditions Model

The with project conditions model will use the same regulatory discharges and cross-section locations as the regulatory conditions model but will reflect the **development** on the **site**. The applicant should first run the model using the with project topography with the fixed encroachments set at the existing condition. If the conveyance, storage, and travel time are maintained and the **flood** stages are not increased, the with project **floodway** will be allowed if it does not differ from the existing conditions **floodway**. If these conditions are not yet met, there are two options: (1) to revise the design to meet the criteria of the WMO, or (2) to develop a new **floodway** that meets the WMO definition and obtain a **LOMR** from **FEMA**, revising the **regulatory floodway**.

The **regulatory floodway** may be re-designated by the applicant, provided that approvals are received from **FEMA** and the **OWR**. For all designated **floodways**, approval of the re-designation shall be required by **FEMA** through a **CLOMR** and **LOMR**. **FEMA** requires **OWR** concurrence whenever the **tributary area** is greater than one square mile.

REQUIREMENTS FOR DEVELOPMENT WITHIN THE FLOODPLAIN (§602)

Introduction

For the purposes of the WMO, the **floodplain** is the area adjacent to and including a body of water where ground surface elevations are at or below the **100-year flood elevation**. The WMO §602 provides standards for **development** within the **floodplain**. The standards incorporate the minimum requirements of the **OWR** for activities within the **regulatory floodway** and the technical standards of the **NFIP**. Activities in the **regulatory floodway** are limited to **appropriate uses** of the **floodway**.

FPE Determination

The WMO (§601.9) specifies that the **Flood Protection Elevation (FPE)** for the **development site** is two feet above the highest **100-year flood elevation** as determined by:

1. The **BFE** associated with the effective **Cook County FIS**, including any **Letter of Map Change (LOMC)** that has been issued by **FEMA**; and
2. The project-specific **100-year flood elevation** developed in §601.5.

The **FPE** must be determined for all **sites** with **floodplain** areas located on the **site** or adjacent to the **site**. **Buildings** located in a **floodplain** must be elevated to the **FPE** (§602.2) and **buildings** adjacent to a **floodplain** must be elevated or otherwise protected (via **floodproofing**) to the **FPE** (§502.14). The two feet of elevation is added to the highest **100-year flood elevation** to provide a factor of safety for **floods** greater in magnitude than a 100-year event. It should be noted that projects with multiple **SFHAs** may have more than one **FPE** for the **development**.

This factor of safety is the last line of defense for protecting **buildings** and **structures** from **flood** damages. Since the **FPE** defined by the WMO goes above and beyond the **NFIP** requirement of elevating **buildings** to the **BFE**, it will also lower insurance premiums for **structures** that carry **flood** insurance.

All usable space in new **buildings** and additions to existing **buildings** in a **floodplain** must be elevated to at least the **FPE** either on fill or by structural elevation. Additionally, all usable space for **substantial improvements** to existing **buildings** in a **regulatory floodplain** must be elevated to at least the **FPE**. It is acceptable for the floor of an attached garage to be elevated only one foot above the **BFE**, provided that the entry door threshold and other openings are elevated to the **FPE** by either fill or by structural elevation. This concept is illustrated in Figure 6.3.

As outlined in the **TGM**, a **basement** is only allowable if a **Letter of Map Revision Based on Fill (LOMR-F)** effectively removes the lot from the **floodplain**. All electrical, heating, ventilating, plumbing, and air conditioning equipment must also be elevated to at least the **FPE**. All **structures** that are not **buildings** must be constructed at or above the **FPE** or otherwise protected to the **FPE** from **flood** damage.

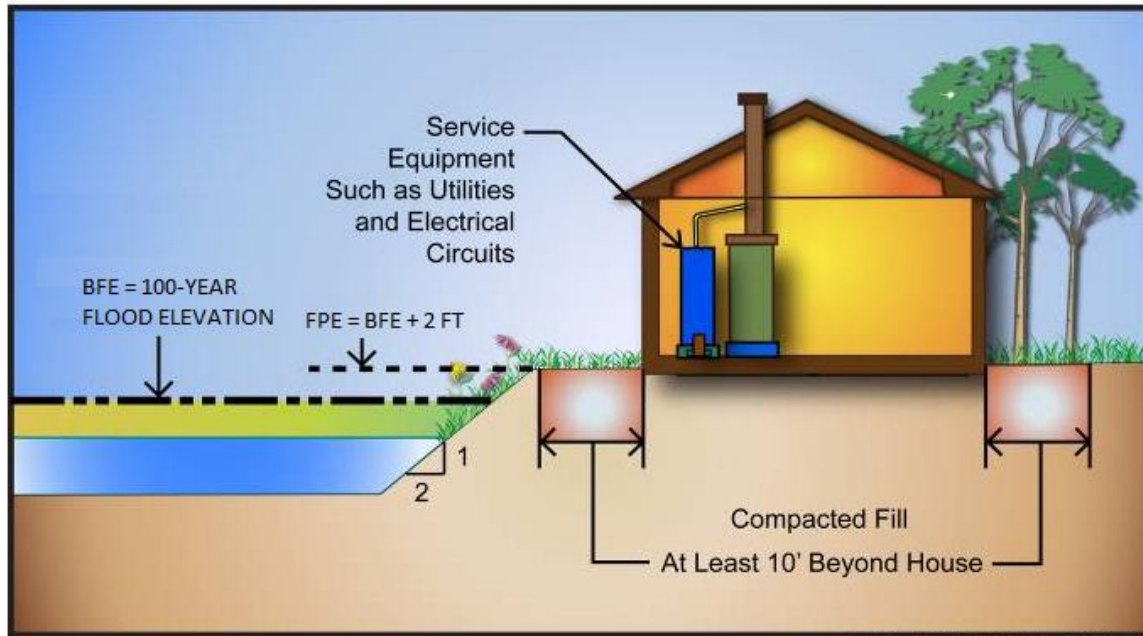


Figure 6.2. BFE, FPE, and Compacted Fill Cross-section for Structure in the Floodplain (Assumes No LOMR-F)

Building Protection

The **FPE** determined in §601.9 applies to all **structures** located in the **floodplain**. Understanding the definitions of **structures**, **buildings**, usable space, and **accessory structures** is important to understand when the WMO requirements apply.

Structures are defined by the WMO as:

*Anything that is erected or constructed on or below ground including, but not limited to, **buildings**, **manufactured homes**, **accessory structures**, fences, sheds, tanks, **dams**, sewers, constructed channels, **outfalls**, parking lots, driveways, roads, sidewalks, and concrete patios.*

Buildings are defined by the WMO as:

*A **structure** that is constructed and is enclosed by walls and a roof, including **manufactured homes**. This term does not include **accessory structures**.*

Accessory Structure is defined by the WMO as:

*A detached, non-habitable **building** without sanitary facilities that is an accessory to an existing **building** and that is less than 500 square feet in area. **Accessory structures** include, but are not limited to, garages and sheds.*

Usable Space can be defined as:

Enclosed space used for dwelling, storage, utilities, or other beneficial purposes

including, but not limited to, **basements** and attached garages.

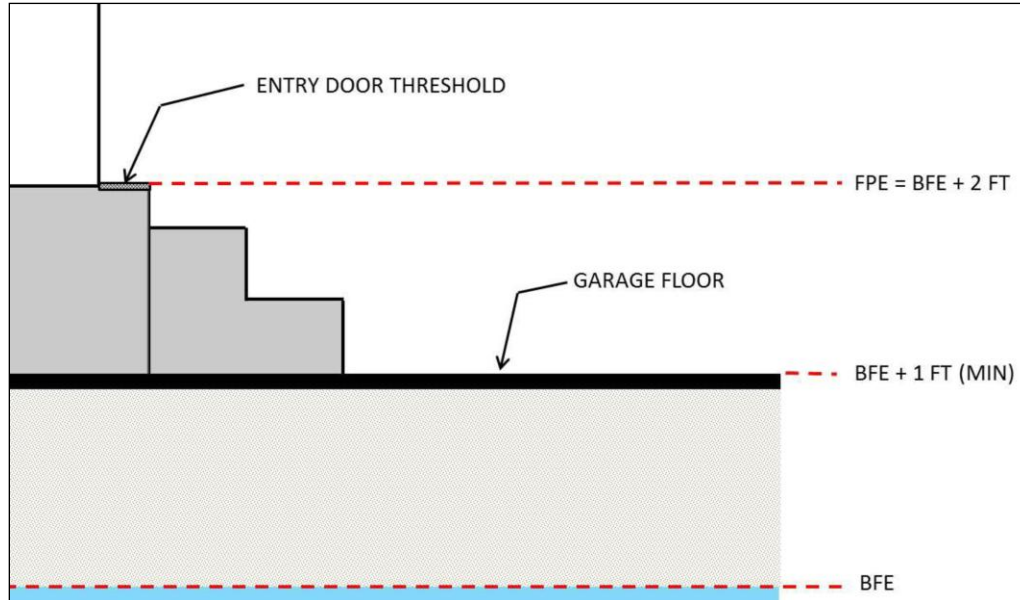


Figure 6.3. BFE and FPE for Structures with Attached Garages

New and Existing Buildings

New **buildings**, additions to existing **buildings**, or **substantial improvements** to existing **buildings** within the **regulatory floodplain** but outside the **regulatory floodway**, that have their **lowest floor** below the **BFE**, must comply with the following:

- The lowest adjacent grade to the foundation must be at or above the **BFE** for a minimum distance of 10 feet beyond the outside face of the **structure** for **buildings** without **basements**;
- The lowest adjacent grade to the foundation must be at or above the **BFE** for a minimum distance of 20 feet beyond the outside face of the **structure** for **buildings** with **basements** (see Figure 6.4);
- The lowest opening in the foundation wall must be at or above the **FPE**;
- **Compensatory storage** per §602.9 and §602.10 must be provided;
- It must be demonstrated that a **building** and **building site** are reasonably safe from **flooding** per design requirements in Technical Bulletin 10-01 issued by **FEMA** (available at <http://www.FEMA.gov/media-library-data/20130726-1511-20490-3169/tb1001.pdf>); and
- A **LOMR-F** must be obtained if the **building site** is in the **regulatory floodplain**.

If the **site** of a proposed **building** within a **development site** is elevated by fill such that **FEMA** will provide a **LOMR-F**, then a **basement** can be constructed below the **BFE**. This is an allowable

practice since the **LOMR-F** effectively removes the area from the **floodplain**, and therefore the **NFIP** requirements are no longer applicable to **development** on this land.

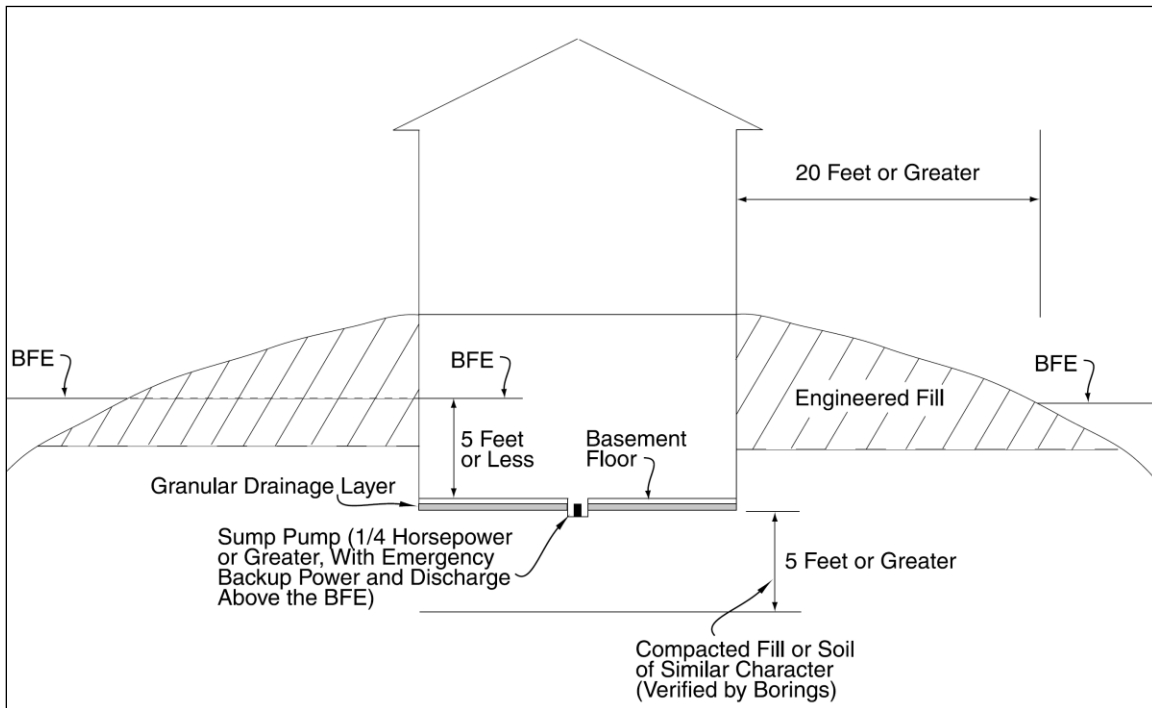


Figure 6.4. BFE and Setback Distance for Buildings with Basements (FEMA, 2001)

The WMO contains additional requirements for **development** in the **floodplain** (§602.12). New **structures** that are elevated, existing **structures** that are **floodproofed**, or **substantial improvements** shall:

- A. Be anchored to prevent flotation, collapse, or lateral movement;
- B. Use **flood** resistant materials below the **FPE**;
- C. Use construction methods and practices that do not increase the potential for increases in **flood** damage;
- D. Elevate electrical, heating, ventilation, plumbing, air conditioning equipment, and other service facilities to the **FPE** or higher;
- E. Provide adequate access and drainage; and
- F. Provide a backup power source that will activate without human intervention if electricity is required.

Accessory Structures

New **accessory structures** within the **floodplain** shall be elevated according to the **NFIP Ordinance** adopted by the **municipality**. At a minimum, **accessory structures** must be elevated to the **BFE**.

Parking Lots

There is no specified maximum **flood** depth on new parking lots in the **floodplain**, however, any parking lot built below the **100-year flood elevation** must clearly post the potential **flood** hazard.

Water and Wastewater Systems

New and replacement water supply systems, wells and sanitary systems in areas adjacent to or within the **floodplain** must have all above ground openings above the **FPE** or be watertight (§602.19). New waste disposal systems on the **site** shall not be constructed within the **floodplain** (§602.22).

Methods for Providing Flood Protection

As discussed above, new **buildings**, new additions to existing **buildings**, or existing **buildings** in the **floodplain** undergoing **substantial improvement** must have all usable space elevated to the **FPE** (which is two feet above the **BFE**). **Floodproofing** is not permitted on new **buildings**, both residential and **non-residential**. Instead, the **building** must be elevated. This can be accomplished a number of ways, as discussed below.

Elevation Using Fill

Fill may be placed on a **site** to elevate a portion of the property above the **FPE** in order to provide a buildable area for a proposed **building** or **structure**. Any fill used to elevate a **building** must extend at least 10 feet beyond the foundation before the grade slopes below the **100-year flood elevation** (§602.13). This 10-foot buffer around the **building** reduces potential damage and impacts resulting from hydrostatic forces on the **building** from the surrounding **base flood** waters.

Any fill required to elevate a **building** or **structure** to the **flood protection elevation** must also adhere to all other provisions of the WMO. Any fill placed within the **floodplain** to meet **flood** protection requirements must also meet **compensatory storage** requirements as outlined in §602.9 and §602.10 of the WMO.

FEMA provides a document with information to help ensure that **buildings** or **structures** built on fill are reasonably safe from **flooding**. This document is entitled *Technical Bulletin 10-01* and is available on **FEMA's** website on-line at:

<http://www.FEMA.gov/media-library-data/20130726-1511-20490-3169/tb1001.pdf>

Elevating by Means Other Than Fill

Elevating a **building** or **structure** to provide the required **flood** protection by means other than filling when within the **floodplain** may be permitted (§602.14). This may be accomplished using stilts, piles, walls, or other foundations. All other provisions of the WMO apply. Additional guidance related to the provisions in §602.14 is contained in the **FEMA** publication *Elevating Residential Structures* (**FEMA** 54). This document is available on **FEMA's** website on-line at:

<http://www.FEMA.gov/media-library-data/20130726-1509-20490-6744/FEMA54.pdf>

Floodproofing of Existing Structures

Existing **structures**, including **buildings**, in the **floodplain** may be **floodproofed** (§602.12). New **structures**, other than **buildings**, can be **floodproofed** (§602.4). For both cases, the requirements of §602.12 and §602.14 must be followed. **Floodproofing** is defined in the WMO as “additions, changes, or adjustments to **structures** or land that prevent the entry of **flood** water in order to protect property from **flood** damage.” **FEMA** provides a number of publications on **floodproofing**, including *Non-Residential Floodproofing – Requirements and Certification* (FIA-TB-3).

Compensatory storage is not required for any **floodproofing** measures or protection of an existing **structure** or existing **building** provided that the **flood** protection measures are within 10 feet of the outside face of the **structure**. Any fill or material required for **floodproofing** beyond 10 feet of the outside of the **structure** shall require **compensatory storage**. Further information regarding **compensatory storage** can be found below.

Substantial improvements to Existing Structures in the Regulatory Floodplain

The same requirements apply to **substantial improvements** made to existing **buildings** located in the **regulatory floodplain** and outside the **regulatory floodway**. The footprint of existing **buildings** located in the **regulatory floodway** cannot be increased. According to the **FEMA** definition, **substantial improvement** is any repair, reconstruction, rehabilitation, addition, or other improvement of a **building**, the cost of which improvement equals or exceeds, individually or in the aggregate, 50 percent of the fair market value of the **building**. Communities participating in the **NFIP** may have a more restrictive definition of **substantial improvement** and the local government agency **NFIP** Ordinance should be consulted.

The administrative requirement to determine if an improvement is a **substantial improvement** is the responsibility of the **NFIP** community and may include activities that do not affect **stormwater**, such as internal remodeling or exterior improvements such as siding and windows. The **District** does not regulate **substantial improvements** under the WMO.

Elevating Structures Outside of the Regulatory Floodplain

There are many **flood-prone structures** throughout **Cook County** that are not mapped within an **SFHA**. These **structures** do not **flood** as a result of overbank **flooding** from a **waterway**, but rather from **storm events** exceeding the design capacity of the local drainage system. Since these **structures** are not within the **regulatory floodplain**, the **structure** can be elevated by means other than fill and are not bound to the requirements of §602.3 of the WMO. There are two acceptable methods for elevating these types of **structures**, which includes: (1) elevating the top of the **basement** window well to the **FPE** (as shown in Figure 6.5), and (2) the construction of a **flood** control berm that is elevated to the **FPE**. The **FPE** in these cases is the **100-year flood elevation** (if known), or the historical **flood** elevation, plus two feet of freeboard.

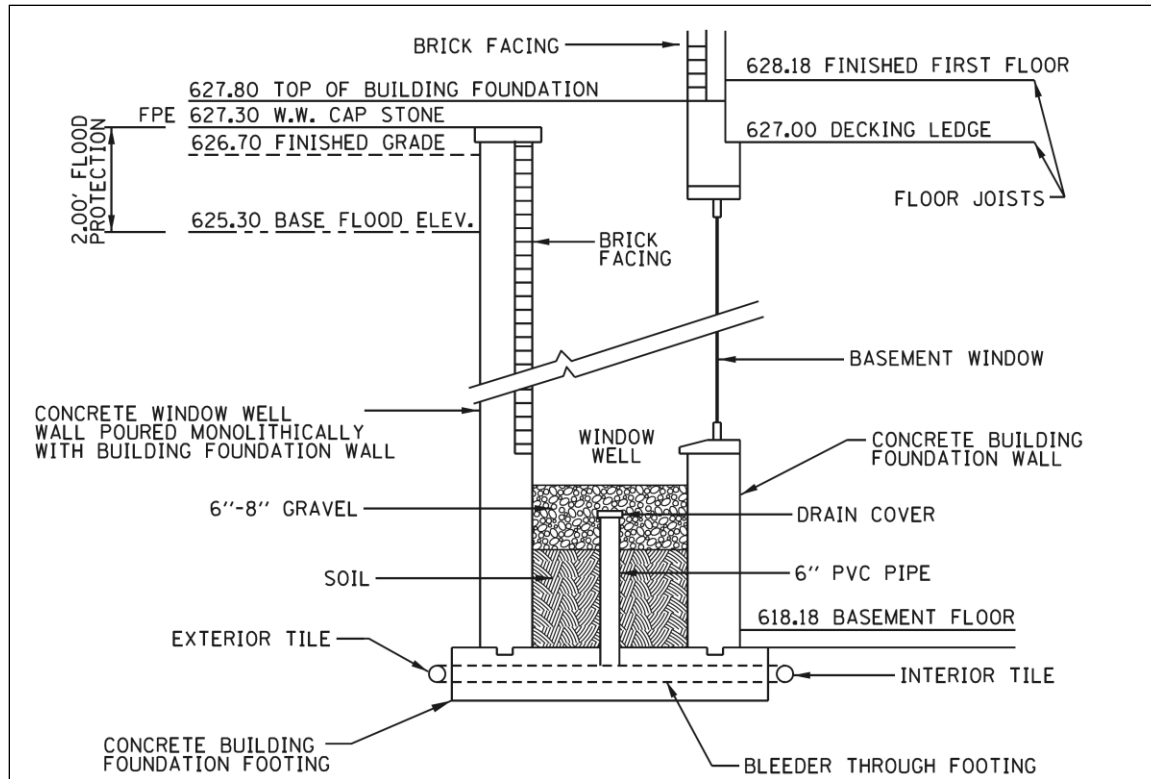


Figure 6.5. Waterproofed Window Well Elevated to the FPE

As shown in Figure 6.5 above, the window well must be poured with the **building** foundation wall and elevated to the **FPE**. In addition, the window well drain must be tied into the **building's** drain tile/sump pump system to avoid a hydraulic connection to the flooding source.

Stormwater Facilities and Detention in the Regulatory Floodplain

Stormwater Facilities and Storm Sewer Outfalls

Stormwater facilities are allowed in the **regulatory floodplain**. Per the WMO §602.18, **stormwater facilities**, such as culverts, bridges, and impoundments that have an associated backwater cannot not be removed, replaced, or modified unless:

1. All **structures**, including **buildings**, within the backwater area of the existing **stormwater facility** are identified and their associated **lowest entry elevations** are determined;
2. **Hydraulically equivalent compensatory storage** is provided to mitigate any potential increases in flow or **flood** elevations upstream or downstream of the **stormwater facility** that is removed, replaced, or modified; and
3. A **water resource benefit** is provided to the area as a result of the removal, replacement, or modification of the **stormwater facility**.

The **structures**, including **buildings**, within the backwater area should be shown on a map or exhibit, and the **lowest entry elevation** should be determined by a field survey. The water

resources benefit means that there must be a decrease in **flood** elevations, a reduction in **flood** damages to **structures** upstream or downstream of the **development site**, and/or enhancement of existing water-related environmental resources.

The WMO (§602.25) requires that new or modified **storm sewer outfalls** in the **regulatory floodplain** must meet the general **site** requirements (§501), **site runoff** requirements (§502), and **Illinois Department of Transportation's (IDOT)** minimum standards. Relevant **IEPA** and **NPDES** permits are required for all new **outfalls** to **waterways** and Lake Michigan.

Detention Facilities in the Floodplain and Regulatory Floodway

The WMO prohibits construction of **detention facilities** within the **regulatory floodway** (§602.23). This is to ensure that the **floodway** is available for **flood** water conveyance. The WMO §602.24 allows **detention facilities** to be located outside of the **regulatory floodway** but within the **floodplain**, provided that the **site runoff** storage facility:

1. Stores the required **site runoff** under all stream flow and backwater conditions up to the **100-year flood elevation**, assuming a zero release rate below the **100-year flood elevation**; and
2. Does not allow design release rates to be exceeded under any stream elevation less than the **100-year flood elevation**.

Detention facilities must also meet the requirements of §504.11 of the WMO.

During events where the 100-year storm has occurred onsite, but the area downstream of the outlet **structure** (likely the **waterway**) is not at the 100-year **base flood** elevation, the outlet **structure** will have no tailwater. For this condition, it must be verified that the release rate for the **site** has not been exceeded.

Detention within the **floodplain** utilizes the existing **floodplain** area to store **stormwater runoff**. The difficulty with this approach is demonstrating timing. The applicant must demonstrate that the **stormwater runoff** is stored or detained before the floodwaters rise and fill the basin. Detention volumes must be sized for maximum tailwater conditions, while detention release rates are sized for no tailwater. This is discussed in more detail in Article 5.

Compensatory Storage in the Regulatory Floodplain

It is necessary to preserve the natural storage within **floodplains**. Filling without providing **compensatory storage** could lead to increases in **flood** depths and the frequency of **flooding**. **Compensatory storage** is the replacement of storage within the **floodplain** and **floodway** due to filling or the construction of **structures** as part of a project. **Compensatory storage** is required to ensure that new **development** does not result in an increase in **flood** heights on adjacent properties or an increase in **flood** flows.

The WMO requires **compensatory storage** for any fill, **structure**, or other material above the existing ground elevation in the **regulatory floodplain** that temporarily or permanently

displaces **floodplain** storage volume (§602.9). **Compensatory storage** must:

- Equal at least 1.1 times the volume of **flood** storage lost below the **BFE**;
- Be operational prior to the placement of fill, **structures**, or other materials temporarily or permanently placed in the **regulatory floodplain**;
- Be provided in the immediate vicinity of the **flood** storage lost, where practicable;
- Be provided in addition to the **site** detention volume; and
- Drain freely and openly to the **waterway**.

The WMO (§602.10) also requires that **compensatory storage** be provided incrementally such that:

- All **regulatory floodplain** storage lost below the existing regulatory 10-year **flood** elevation shall be replaced below the proposed regulatory 10-year **flood** elevation;
- All **regulatory floodplain** storage lost above the existing regulatory 10-year **flood** elevation shall be replaced above the proposed regulatory 10-year **flood** elevation; and
- The additional **compensatory storage** required beyond a one to one (1:1) ratio may be placed above or below the proposed regulatory 10-year **flood** elevation.

Note that the WMO requires **compensatory storage** for activities in the **regulatory floodplain**. There is no minimum for providing **compensatory storage**; any volume of fill requires **compensatory storage** be provided. However, the **compensatory storage** requirement does not apply to specific activities in the **regulatory floodplain**, such as the **floodproofing** of an existing **building**, where the **floodproofing** measures such as berms or floodwalls are within 10 feet of the **building**.

Table 6-2. Compensatory Storage by Development

WMO Section	Development	Compensatory Storage (in Regulatory Floodplain)
§602.2, §602.3, §602.4	New or Existing Buildings , and New Structures , Elevated by Fill	Yes
§602.14	New or Existing Buildings , and New Structures , Elevated by Method Other Than Fill	No
§602.11	Floodproofing of Existing Buildings and Structures	Not for volume displaced by building and 10 feet from building

Computing Compensatory Storage

The WMO requires that for any fill placed within the **floodplain**, 1.1 times the volume of **compensatory storage**, i.e., cut, is provided. Fill is measured between the existing ground elevation and the *existing* 10-year and **100-year flood elevations**. **Compensatory storage** needs to be provided between the proposed ground elevation and the *proposed floodplain* elevation. In some instances during large **developments** or regrading projects, the **BFEs** are modified due to cuts and fills or relocation of the **waterway**. This is why the **compensatory storage** is then provided between the proposed ground elevations and the proposed **floodplain** elevation. In many projects the existing and proposed **floodplain** elevations will remain unchanged.

Referring to Figure 6.7, equivalent storage lost between the existing ground and the existing 10-year **flood** elevation must provide **compensatory storage** between the proposed ground elevation and the proposed 10-year **floodplain** elevation. Storage lost between the existing 10-year and the existing **100-year flood elevation** must be compensated for between the proposed 10-year and proposed **100-year flood elevations**. The additional **compensatory storage** required beyond the 1:1 ratio may be placed either above or below the 10-year **flood** elevation.

It should be noted that no **compensatory storage** credit will be given for any cut below the normal water level. In addition, some **municipalities** may prescribe **compensatory storage** requirements that differ from the 1.1:1 ratio specified in the WMO. For projects in these communities, the applicant should follow the more restrictive **compensatory storage** requirement.

When preparing a grading plan, thought should be given to how **compensatory storage** will be quantified. The acceptable method of calculating cut and fill volumes is the use of cross-sections and the “average end method.” The following requirements should be followed when preparing cross-sections:

1. Prepare a detailed topographic survey tied to the North American Vertical Datum of 1988 and the **Cook County** Survey Control Network benchmarks.
2. Locate cross-sections parallel to each other and perpendicular to a reference line, oftentimes a property line or fence line. Cross-sections used in a hydraulic model are always perpendicular to **flood** flows, and not always parallel to each other. Therefore, these are often not suitable for computing **flood** fringe **compensatory storage** volumes.
3. Plot cross-sections at a standard engineering scale so as to allow the reviewer to verify areas. The horizontal scale should be a maximum of 1 inch = 50 feet and vertical scale should be a maximum of 1 inch = 5 feet, or as approved by the **District**.
4. Show existing ground elevations, proposed ground elevations, existing and proposed 10-year **flood** elevations, existing and proposed **100-year flood elevations**, normal water level, a reference line, and **floodway** limits on the cross-sections on the plans.

5. Locate cross-sections no more than 150-feet apart, with a minimum of three cross-sections per cut/fill area, or as necessary to accurately quantify cuts and fills.
6. Locate cross-sections to pick up critical features such as berms, ditches, and existing and proposed **structures**.
7. Each cross-section should be numbered or lettered and referenced on the plans.

This information can then be utilized to compute the areas of cut and fill. A sample **compensatory storage** plan is provided as Figure 6.6 and the **compensatory storage** calculations are shown in Table 6-3. For clarity, the topography has not been included on Figure 6.6.

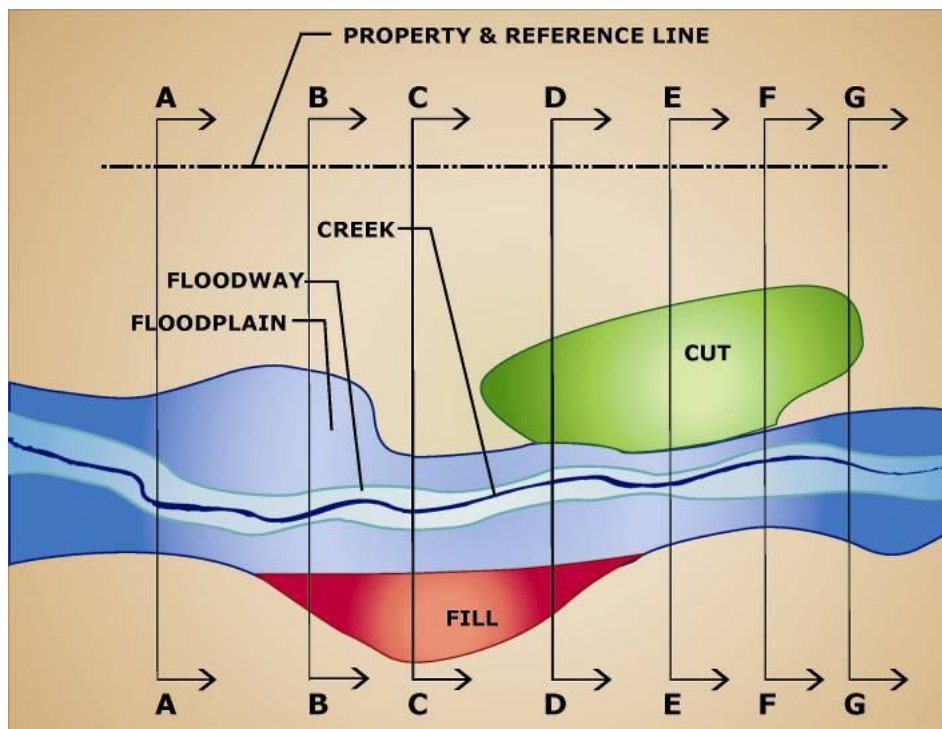


Figure 6.6. Compensatory Storage Calculation Example

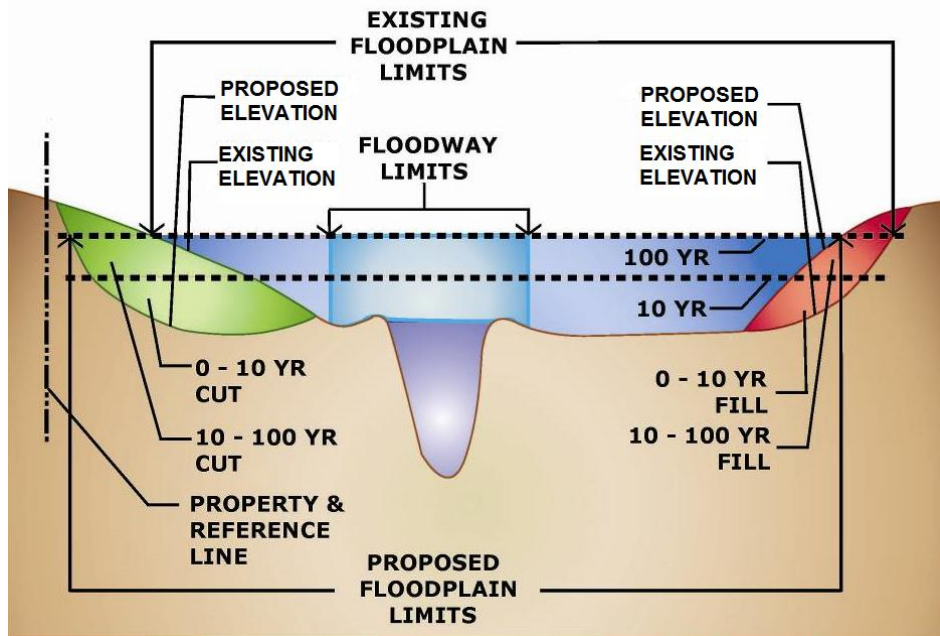


Figure 6.7. Cross-section D-D from the Compensatory Storage Plan provided in Figure 6.6

Table 6-3. Example of Compensatory Storage Calculation, 0 – 10 Year Increment

Cross-Section ID	Distance (ft)	Fill Area (ft ²)	Average Fill Area (ft ²)	Volume of Fill (ft ³)	Cut Area (ft ²)	Average Cut Area (ft ²)	Volume of Cut (ft ³)
A		0			0		
	150		50	7,500		0	0
B		100			0		
	90		125	11,250		0	0
C		150			0		
	100		125	12,500		62.5	6,250
D		100			125		
	100		50	5,000		142.5	14,250
E		0			160		
	100		0	0		175	17,500
F		0			190		
	85		0	0		127.5	10,838
G		0			65		
Total Fill =				36,250	Total Cut =		48,838
Compensatory Storage Required = 1.1* Fill =				39,875			

Equation Formulas for Table 6-3:

Fill area between Cross-sections A & B:

$$\text{Average Fill Area} = \frac{\text{Fill Area "A"} + \text{Fill Area "B"}}{2}$$

$$\text{Average Fill Area} = \frac{0 \text{ ft}^2 + 100 \text{ ft}^2}{2} = \boxed{50 \text{ ft}^2}$$

Fill volume between Cross-sections A & B:

$$\text{Volume of Fill} = (\text{Average Fill Area}) \times (\text{Distance})$$

$$\text{Volume of Fill} = (50 \text{ ft}^2) \times (150 \text{ ft}) = \boxed{7,500 \text{ ft}^3}$$

Compensatory Storage required for fill placed between the 0- and 10-yr **flood** elevation:

$$\text{Required Compensatory Storage} = (1.1) \times (\text{Total Volume of Fill})$$

$$\text{Required Compensatory Storage} = (1.1) \times (36,250 \text{ ft}^3) = \boxed{39,875 \text{ ft}^3}$$

Is the Total Volume of Cut Provided greater than or equal to the Total Required Volume of Cut (**Compensatory Storage**)?

$$48,838 \text{ ft}^3 \geq 39,875 \text{ ft}^3 \rightarrow \text{OK}$$

The total **floodplain** fill is multiplied by 1.1 to determine the cut required. The total **compensatory storage** for this **site** must be at least 36,250 multiplied by 1.1, which is 39,875 cubic feet. Table 6-3 shows that 48,838 cubic feet will be provided, which meets the 1.1:1 **compensatory storage** requirement.

It is not permissible to subtract the fill from the cut for each cross-section. For example on cross-sections C & D, the volume of fill is 12,500 cubic feet and the volume of cut is 6,250 cubic feet. It is not permissible to subtract 6,250 from 12,500 and multiply the result (6,250) by 1.1 (6,250*1.1=6,875). This results in inadequate volume.

Instead, for this cross-section, 12,500 cubic feet is multiplied by 1.1 which results in 13,370 cubic feet of required **compensatory storage**. This computation for each cross-section also equals the 39,875 cubic feet of required total **compensatory storage** for the **site**. Again, the sum of the volume of cut in Table 6-3 shows that 48,838 cubic feet will be provided, which meets the 1.1 **compensatory storage** requirement.

Location of Compensatory Storage

Compensatory storage must be located onsite and adjacent to or opposite the areas filled or occupied by a **structure**. In those rare instances when **compensatory storage** cannot be located

adjacent to or opposite to the areas filled or occupied, engineering computations are required that demonstrate **hydraulically equivalent compensatory storage** has been provided. These computations must show that no increase **flood** depths (≤ 0.10 foot) will result from the location of the proposed **compensatory storage**.

Compensatory storage must be constructed to drain freely and openly to watercourses (§602.9.E). In some rare cases it may be necessary to install pipes to construct and/or operate a **compensatory storage** basin. This may occur when **site** constraints, such as a roadway or sidewalk, separate the **waterway** from the **compensatory storage** area. This is illustrated in the top half of Figure 6.8.

Another scenario may occur when a **site** cannot meet the incremental storage requirements of the WMO. If incremental storage requirements from the 10-year to **100-year flood elevations** cannot be met, pipes could be installed with a flap gate to prevent the water from entering from the stream bed at lower elevations. The berm could then be set at the elevation of the 10-year **BFE**, thus allowing the storage to only become effective above the 10-year **flood** elevation. This is illustrated in the bottom half of Figure 6.8.

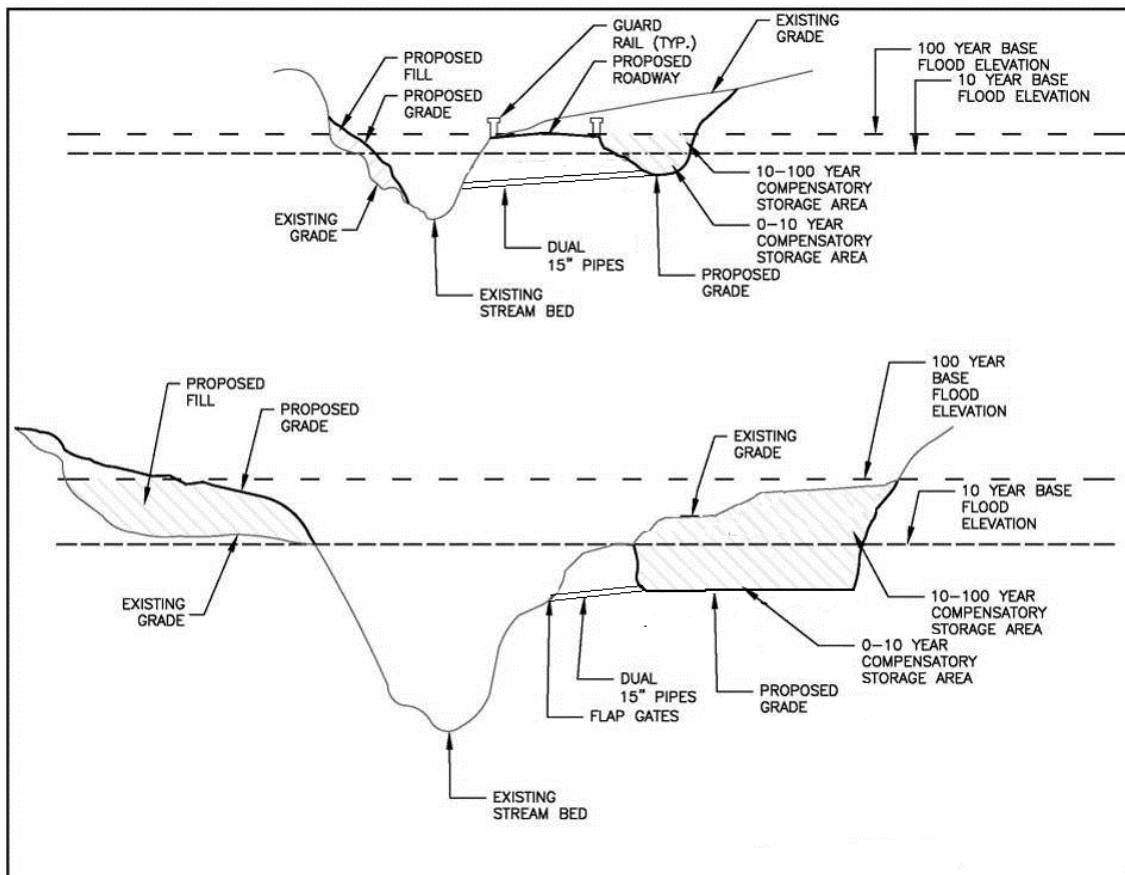


Figure 6.8. Example of a Compensatory Storage Plan

The use of pipes in **compensatory storage** will require approval by the **District** or an **authorized municipality**. If approved, two pipes will be required to reduce the risk of clogging. Pipes must be a minimum of 15 inches in diameter so as to allow water to enter and exit freely with a minimum head differential. If the **compensatory storage** is proposed to be combined with detention, it must be demonstrated that the entire storage volume is accessed during a **storm event** by analyzing the timing of both the **compensatory storage** and detention storage.

Development in the Regulatory Floodway

Appropriate Uses

In Illinois, the **OWR** has been delegated the authority over **regulatory floodways**. **OWR** has jurisdiction of those areas designated on the **FIRM** as the **regulatory floodway**, and also any **waterway** that drains more than one square mile of area. Any **development** in the mapped **regulatory floodway**, or in an area that drains more than one square mile, will require a **Floodway Construction Permit** from the **OWR**. The **OWR** permit application is available on-line at:

<http://www.dnr.illinois.gov/WaterResources/Documents/JointpermitApp.pdf>

Only **appropriate uses** as defined within the WMO will be permitted within the **regulatory floodway**. The list of **regulatory floodway appropriate uses** can be found in §602.29 of the WMO. These are taken from the **OWR's Part 3708 - Floodway Construction in Northeastern Illinois**. The **OWR** Part 3708 rules are available on-line at:

<http://www.dnr.illinois.gov/adrules/documents/17-3708.pdf>

Appropriate uses are those **developments** necessary or that provide a **stormwater** benefit to the **watershed**. These **appropriate uses** are based on the WMO's goals and objectives to improve water quality and mitigate or minimize **stormwater flood** damages. Any proposed **development** in the **regulatory floodway** must also meet the requirements for **development** in a **floodplain** (§602). Only the following **appropriate uses** shall be considered for permits for **development** in a **floodway**:

1. **Flood** control **structures**, dikes, **dams**, and other public works or private improvements relating to the control of drainage, **flooding**, or **erosion**, or water quality or habitat for fish and wildlife that provides a **water resource benefit**;
2. **Structures** or facilities relating to the use of, or requiring access to, the water or shoreline, such as pumping and treatment facilities, as well as facilities and improvements related to recreational boating, commercial shipping, and other functionally dependent uses;
3. Storm and **sanitary sewer outfalls**;
4. Underground and overhead utilities;

5. Recreational facilities such as playing fields and trail systems including any related fencing built parallel to the direction of **flood** flows;
6. Detached garages, storage sheds, or other non-habitable **accessory structures** to existing **buildings** that will not block **flood** flows. This does not include the construction or placement of any other new **structures**, fill, **building** additions, **buildings** on stilts, fencing (including landscaping or plantings designed to act as a fence), and the storage of materials;
7. Bridges, culverts, roadways, sidewalks, railways, runways, and taxiways, and any modification thereto;
8. Parking lots built at or below existing grade where either:
 - a. The depth of **flooding** at the **BFE** will not exceed one foot; or
 - b. The parking lot is for short-term outdoor recreational use facilities where the applicant agrees to restrict access during overbank **flooding** events and agrees to accept liability for all damage caused by vehicular access during all overbank **flooding** events. Signs shall be posted to clearly identify the **flooding** hazard.
9. Aircraft parking aprons built at or below ground elevation where the depth of **flooding** at the **BFE** will not exceed one foot;
10. **Regulatory floodway** re-grading without fill to create a positive slope toward the watercourse;
11. **Floodproofing** activities to protect existing **structures** including, but not limited to, constructing water tight window wells and elevating;
12. The replacement, reconstruction, or repair of a damaged **building**, provided that the outside dimensions of the **building** are not increased, and provided that, if the **building** is damaged to 50% or more of the **building's** market value before it was damaged, the **building** will be protected from **flooding** at or above the **FPE**; and
13. Modifications to an existing **building** that would not increase the enclosed floor area of the **building** below the **BFE**, and would not block **flood** flows to – including, but not limited to – fireplaces, bay windows, decks, patios, and second story additions.

Certain types of projects are authorized by the **OWR** through Statewide and General Permits, and therefore do not require permitting through the **OWR**. For these types of projects, a letter from the **OWR** that verifies the proposed project is in compliance with the requirements of the Statewide or General Permit should be submitted to the **District** or the **authorized municipality**. The **OWR** Statewide and General Permits are available on-line through the **OWR's** website at:

<http://www.dnr.illinois.gov/waterresources/pages/permitsstatewideregionalgeneral.aspx>

Regulatory Floodway Performance Standards

The WMO (§602.27) requires that a **development** must preserve effective the **regulatory floodway conveyance** such that there will be no increases in **flood** elevations, flowrates, or **regulatory floodway** velocity, unless:

1. These increases are contained in a public **flood** easement;
2. A **water resource benefit** is provided; and
3. A **CLOMR** is issued by **FEMA** prior to any work in the **regulatory floodway**. Only **appropriate uses** of the **regulatory floodway** are allowed by the WMO (§602.29). If a portion of the **regulatory floodway** is vital to a **development** and the **development** is not an **appropriate use**, then the **regulatory floodway** must be relocated, but in such a manner that all requirements of §602.27 are met.

The **floodway conveyance**, K, is calculated at each cross-section using the following:

$$K = \frac{1.49}{n} * A * R^{2/3}$$

Where,

n = Manning's roughness coefficient,

A = effective flow area of the cross-section, and

R = hydraulic radius.

For any proposed **development** within the **regulatory floodway**, the applicant must provide the **District** or **authorized municipality** with an evaluation of the hydrologic and hydraulic impacts of the **development** (§304.10) in order to prove compliance with §602.28:

1. Using the **regulatory floodplain** model, if available, or a study as directed by the **District** or **authorized municipality** using the methodology provided in §601.6;
2. For the 2-year, 10-year, and 100-year **storm events** for the 24-hour event, at a minimum; and
3. For existing and any future planned **watershed** conditions as directed by the **District** or **authorized municipality**.

The impacts must meet the standards in §602.27 of the WMO. Minor **development** projects that don't involve fill in the **floodway** and have a hydraulic impact may not require a hydraulic and hydrologic analysis and will be evaluated on a case-by-case basis by the **District** or **authorized municipality**.

Results must show no increase in **flood** flows or **flood** elevations for the full range of **storm events** (50 percent (2-year) through the one percent (100-year) **storm events**). For **OWR** permitting purposes, proposed **developments** must show no more than a 0.04-foot increase in **flood** elevations. This threshold demonstrates “no increase.” **FEMA** coordinates with **OWR** on the issuance of **CLOMR**.

Compensatory Storage in the Regulatory Floodway

Only **developments** that are considered **appropriate uses** of the **regulatory floodway** will be allowed to fill within the limits of the **floodway**. Any fill placed within the existing **floodway** must be compensated for within the proposed **floodway**. All **floodway** storage lost below the existing 10-year **flood** elevation shall be replaced at a 1.1:1 ratio below the proposed 10-year **base flood** elevation. All **floodway** storage lost between the existing 10-year **flood** elevation and the existing **100-year flood elevation** shall be replaced at a 1.1:1 ratio between the proposed 10-year and proposed **100-year flood elevation**.

There shall be no reduction in **floodway** surface area as a result of a **floodway** modification, unless such modification is necessary to reduce **flooding** at an existing **structure**.

Per the **OWR** Part 3708 Rules, cross-sections used in the **compensatory storage** calculations must be located perpendicular to **flood** flows. These cross-sections may be different than those utilized for computing **flood** fringe **compensatory storage**. The average end method should be used when calculating the **floodway compensatory storage**.

Other Development in the Regulatory Floodway

If the proposed **development** does not constitute an **appropriate use** as defined in the **OWR** Part 3708 Rules, the **development** may only take place if the **regulatory floodway** boundary is revised to remove that area from the **regulatory floodway**. The following process is required to revise the **regulatory floodway** boundary:

1. A **CLOMR** must be issued by **FEMA** that acknowledges that the **regulatory floodway** will be revised if the project is constructed. Approval from the **municipality** must be obtained by using **FEMA’s** Community Acknowledgement Form. Concurrence from the **District** or **authorized municipality** and the **OWR** is also required.
2. Construct only that portion of the project that will result in the revision to the **regulatory floodway** boundary.
3. Based on the as-built plans for the project, **FEMA** must issue a **LOMR** for the **site**. Approval from the **municipality**, the **OWR**, and the **District** is also required. The **LOMR** officially revises the **floodway** boundary on the **site**.
4. Since the **floodway** is now removed from that portion of the **site**, **development** in that area is no longer subject to the **appropriate use** regulations.

REQUIREMENTS FOR WETLAND BOUNDARY, QUALITY, AND BUFFER WIDTH DETERMINATION (§603)

Introduction

Wetlands may provide a variety of functions, including natural **stormwater** storage, attenuation of peak **floods**, **groundwater** recharge, water quality enhancement, plant and wildlife habitat, and aesthetic, recreational, educational, and economic benefits.

The “Federal Water Pollution Control Act of 1972,” referred to as the Clean Water Act (CWA), established objectives for restoring and maintaining the chemical, physical, and biological integrity of the nation’s waters. The Secretary of the Army, acting through the **Army Corps of Engineers (Corps)**, is authorized to issue permits for the discharge of dredged or fill material into the **waters of the United States (US)**, including **wetlands**, under Section 404 of the CWA. Section 10 of the Rivers and Harbors Act of 1899 authorizes the **Corps** to regulate **structures** and regulate work that is performed in, over, or under navigable waters of the US. Some waters may be regulated under both statutes.

For purposes of the Clean Water Act, "**Waters of the United States**" means:

1. All waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
2. All interstate waters, including interstate "**wetlands**";
3. All other waters such as interstate **lakes**, rivers, streams (including intermittent streams), mudflats, sandflats, **wetlands**, sloughs, prairie potholes, wet meadows, playa **lakes**, or natural ponds the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce including any such waters:
 - (a) Which are or could be used by interstate or foreign travelers for recreational or other purposes;
 - (b) From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or
 - (c) Which are used or could be used for industrial purposes by industries in interstate commerce;
4. All impoundments of waters otherwise defined as **waters of the United States** under this definition;
5. Tributaries of waters identified in paragraphs (1) through (4) of this definition;
6. The territorial sea; and
7. **Wetlands** adjacent to waters (other than waters that are themselves **wetlands**) identified in paragraphs (1) through (6) of this definition.

Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of CWA are not **waters of the United States**.

The WMO follows the Clean Water Act of 1972 definition of **wetlands**:

*Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. **Wetlands** generally include swamps, marshes, bogs, and similar areas.*

Jurisdictional and Isolated Waters and Wetlands

Waters and **wetlands** under the regulatory authority of the **Corps** are referred to as “**Jurisdictional Waters of the US**” and “**Jurisdictional Wetlands.**” A **Corps** permit is required for the discharge of dredged or fill material into **jurisdictional waters of the US**, including **wetlands**.

As briefly described above, jurisdictional waters and **wetlands** must meet certain criteria. The USEPA and **Corps** have prepared additional guidance and supporting documentation to further define the intended jurisdictional limits of waters and **wetlands**. However, not all waters and **wetlands** are regulated under the CWA by the **Corps**. Those **wetland** and waters that are not regulated by the **Corps** are referred to as “**isolated waters**” and “**isolated wetlands**”. Because of the importance of all **wetlands**, the WMO regulates **isolated wetlands** – **wetlands** that are not protected at a federal level. Waters and **wetlands** regulated by the **Corps** are not regulated by the WMO.

Request for a Jurisdictional Wetland Determination

Wetlands may or may not be regulated by the **Corps**. To make that determination, a *Request for Jurisdictional Determination* must be submitted to the **Corps**. Generally, if a **wetland** has an identifiable surface or subsurface (piped) water connection to other **jurisdictional waters of the US**, the area will likely be regulated.

The determination of jurisdiction can only be made by the **Corps**, therefore, applicants must request a Jurisdictional Determination from the **Corps** (Chicago District) to document which onsite **wetlands** are, or are not, regulated. *Requests for Jurisdictional Determinations* should be made after the **wetland** delineation report has been prepared. A copy of the **wetland** delineation report should be provided to the **Corps** with the request for Jurisdictional Determination.

Wetlands that are not non-**Corps** jurisdictional will be classified as **isolated wetlands**.

Other Reviews or Authorities

Wetlands are regulated by the Illinois Department of Natural Resources (IDNR) when funding from or through the State of Illinois is involved in the **development**. Regulatory authority is established by the Interagency **Wetland** Policy Act (IWPA) of 1989 [20 ILCS 830]. All **wetland** areas are regulated under the IWPA (**Corps** jurisdictional and isolated). Impacts to **wetland** under the IWPA must be mitigated in accordance with the requirements of that Act.

Additionally, any project that must receive state or local approval must complete threatened and endangered species consultation. Regulations and procedures required under the Illinois Endangered Species Protection Act are established in Title 17 Ill. Admin. Code Part 1090. IDNR

developed the Ecological Compliance Assessment Tool (EcoCAT) to assist with the review of proposed activities.

General Isolated Wetland Mitigation Requirements

Isolated wetlands have been determined to provide important functions that should be protected and mitigated (replaced) when impacts will occur. Mitigation consists of taking steps to avoid or minimize negative environmental impacts. Mitigation can include: minimizing impacts by limiting the degree or magnitude of the action, rectifying the impact by repairing or restoring the affected environment, reducing the impact by protective steps required with the action, and compensating for the impact by replacing or providing substitute resources.

The WMO requires that **isolated wetlands** impacts be mitigated in cases where the impact exceeds 0.10 acre. Further detail is provided under **Wetland Avoidance and Minimization Documentation** in the TGM.

Wetland Boundary, Quality, and Buffer Width Determination

Wetland Identification

Development activities that directly or indirectly impact **isolated wetlands** or their associated buffers are regulated by the WMO. Therefore, the applicant(s) (i.e. **co-permittee**) must identify (delineate) any onsite or offsite **isolated wetland(s)** located within 100 feet of the **development site**. The delineation must be completed in accordance with the current **Corps Delineation Manual** and, if applicable, **Natural Resource Conservation Service (NRCS)** for **farmed wetlands** determinations. Figure 6.9 illustrates these scenarios.

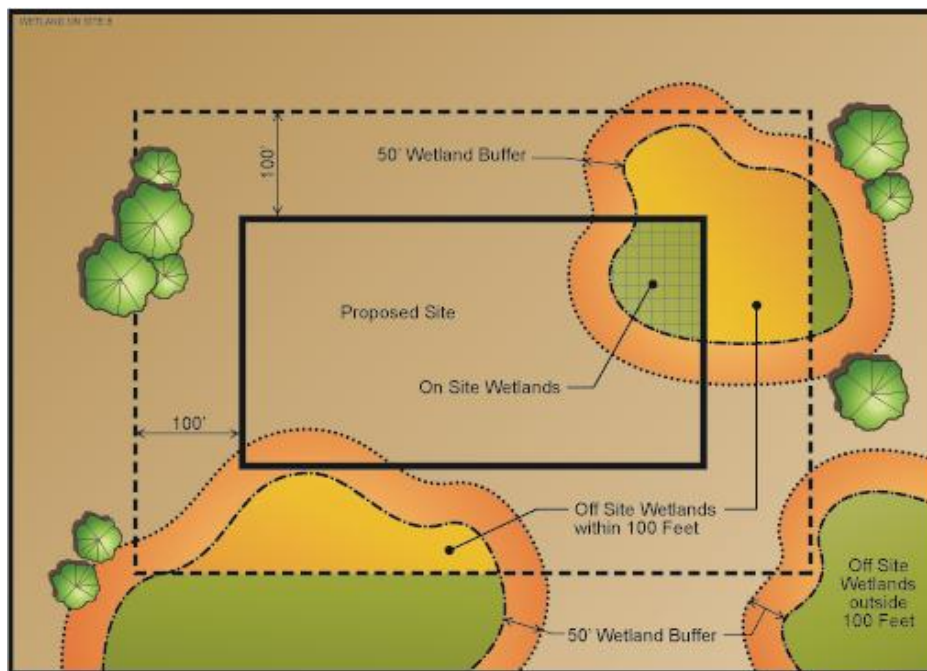


Figure 6.9. Wetland Delineation Scenarios

Onsite Wetland Delineations and Delineation Reports

Onsite **wetland** delineations are to be made using procedures in accordance with the current **Corps Wetland Delineation Manual** (*Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (Version 2.0)*). The manual is available on-line from the **Corps** website at:

http://www.Corps.army.mil/Portals/2/docs/civilworks/regulatory/reg_supp/erdc-el-tr-10-16.pdf

The **Corps** Manual provides data collection requirements, technical guidelines, methods and approaches, and evaluation steps. The WMO places responsibility for identifying the locations of **wetlands** on or offsite on the applicant. **Wetland** delineations should be completed early in the planning process, by trained **wetlands** specialists. The Chicago **District** of the **Corps** maintains an online list of consultants who provide those services.

In accordance with the Delineation Manual, an area qualifies as a **wetland** when the following criteria are met: there is a presence of hydrophytic vegetation, hydric soils, or **wetland hydrology**. If **wetlands** are identified within the **development site**, the **wetland** boundaries must be staked and located via a sub-meter or a more accurate survey and overlaid onto an aerial photo or drawing. **Wetlands** identified offsite, but within 100 feet of the **development site**, shall be delineated using procedures outlined in §603.5. A **wetland** delineation report shall be prepared in accordance with the Delineation Manual and WMO requirements.

The written **wetland** delineation report shall be prepared in compliance with all methodologies and definitions set forth in the WMO and **Corps**. All required documentation to be included in the delineation report may be found in the **wetland** submittal checklist provided in Article 3 of the **TGM**.

Farmed Wetlands Delineations

For **development sites** that are, or have been, used for agricultural production within the past five years, onsite **wetlands** within the agricultural portions of the **site** must be identified and delineated in accordance with the current National Food Security Act Manual (NFSAM) methodology. The NFSAM Manual is available on-line from the US Department of Agriculture, **NRCS** website at:

<http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/alphabetical/camr/>.

It is recommended that **farmed wetland** determinations be completed early in the planning process, by trained **wetlands** specialists. Onsite isolated **farmed wetlands** are subject to the same WMO regulatory requirements as all other non-farmed isolated onsite **wetlands**. Documentation to be included in the delineation report is identified in Article 3.

Onsite Wetland Boundary Verifications

Applicants must contact the **District** or **authorized municipalities** to request a **wetland** boundary verification (§603.7 of the WMO) for all onsite **isolated wetland** determinations and delineations.

Offsite Wetland Delineations

The approximate location, extent and quality of offsite **wetlands** must be identified by the applicant (§603.5 of the WMO). Offsite **wetlands** may be the portion of an onsite **wetland** that extends onto adjoining property, or **wetland** located on an adjacent property within 100 feet of the **development site**. The offsite **wetland** delineation should be completed using the **Corps** Manual whenever possible. If an offsite delineation is not available or cannot be performed, the offsite **wetlands** can be identified by using the following resources:

- National **Wetland** Inventory (**NWI**) Maps from the United States Fish and Wildlife Service (USFWS). The **NWI** map is available at: <http://www.fws.gov/nwi/>.
- **Natural Resource Conservation Service (NRCS) wetland** inventory maps. Contact your local **NRCS** field office to obtain a copy of the map for your project location.
- The location and extent of offsite **wetlands** may be identified using other mapping products, including but not limited to: current and historical aerial photographs, US Geological Survey (USGS) hydrological atlas, Soil Survey of **Cook County**, and USGS topographic maps.

Because the **Corps** requires the signature of the property owner, it is difficult to obtain a Jurisdictional Determination for offsite wetlands. For the WMO, offsite wetlands will be considered isolated for the purposes of determining the required buffer width unless it is clear that the offsite wetland would be **Corps** jurisdictional. Examples of these cases where **Corps** jurisdiction is clear include, but are not limited to the following:

- Wetland fringe or wetland adjoining or adjacent to a **Jurisdictional Waters of the US** (drainageway, creek, stream, river) or a pond/lake with an obvious hydrologic traceable connection to a **Jurisdictional Waters of the US** that has been found to be jurisdictional by the **Corps**.
- Wetland with an obvious hydrologic connection to other **jurisdictional wetland** or wetlands in series that have an obvious traceable connection to a Jurisdictional Waters of the US that have been found to be jurisdictional by the **Corps**.

When the applicant and review authority agree the wetland would clearly be **Corps** jurisdictional, the buffers prescribed by the WMO are not required. It should also be noted that offsite **wetlands** that are more than 100 feet away from the proposed **development** (and are not indirectly impacted by the proposed **development**) do not require a **wetland** submittal. However, a statement of opinion must be provided by a **Wetland Specialist** that confirms this.

Exempt Wetlands

The WMO (§603.6) lists **wetland** areas that are exempt from the requirements of the WMO. Exempt **wetlands** are areas that have developed **wetland** characteristics due to either intentional or incidental human activities, e.g., areas that formed by either excavation upland (non-**wetland**) or were created by artificial **hydrology**. These areas are referred to as man-induced **wetlands** that may be exempt from regulation.

For the purposes of the WMO, the following areas are not considered to be **wetlands** and shall be exempt from the **wetland** requirements of the WMO:

1. **Wetlands** in roadside ditches created by excavation in upland areas;
2. **Wetlands** created by excavation or by other unfinished **development** activities in upland areas;
3. **Wetlands** created by artificial **hydrology**, including but not limited to, irrigation or **site runoff** storage facility outlets that would revert to upland areas if irrigation were to cease;
4. **Wetlands** created by the construction of **stormwater facilities** in upland areas, provided that the facility was not created for the purpose of **wetland mitigation**; and
5. **Wetlands** created by the construction of ponds in upland areas.

Wetland Classification

Introduction

Under §603.8 of the WMO **wetlands** must be categorized as “High Quality” or “Standard Quality” based on an assessment of two criteria. If one or both of the criteria are met, the **wetland** is classified as High Quality. If neither criterion is met, the **wetland** is classified as a standard **wetland**. The following are the criteria to be evaluated:

1. **Swink and Wilhelm Floristic Quality Index (FQI)** value greater than or equal to 20 during a single season assessment, or a native mean C-value of 3.5 or higher as calculated by the Swink and Wilhelm methodology;
2. The **wetland** is known to possess a federal, or state-listed threatened or endangered species based upon consultation with the Illinois Department of Natural Resources (IDNR) and the US Fish and Wildlife Service (USFWS). This is typically determined through submittal of an Ecological Compliance Assessment Tool (EcoCAT) on-line request to IDNR, and by following the USFWS procedures outlined under Section 7 of the Endangered Species Act of 1973.

Swink and Wilhelm Floristic Quality Index and Native Mean C

Wetland specialists, botanists and plant ecologists use a quantitative measure called the Floristic Quality Index (FQI) to express the "quality" of a natural area. The FQI is an indicator of natural plant biodiversity and conservatism that is widely used throughout Northeastern

Illinois. The use of the FQI as an indicator of **wetland** quality requires identification and cataloging of all plant species in the **wetland** during the growing season. This standardized tool provides a useful number for comparing various natural areas.

To calculate the FQI, each plant species is assigned a predetermined value: a coefficient of conservatism (CC) score that is scaled from 0 to 10. The individual score reflects that species' tolerance to disturbance and specificity to a particular habitat type. Once the plant species inventory has been collected, the FQI can be calculated. The FQI is derived by multiplying the sums of the all C-values by the square root of the number of species identified. The Mean C-value is calculated by summing the Coefficients of Conservatism of the identified species and dividing by the total number of species identified. A computer-based Floristic Quality assessment program is available to compute the Native Mean C, FQI, and other applicable information quickly. Programs that complete the tabulation of plants and complete the calculations are available from Conservation Design Forum and Chicago **District Corps** of Engineers.

References:

Swink, F. and G. Wilhelm (1994). Plants of the Chicago Region, 4th ed., Indiana Academy of Science, Indianapolis, 921 pp.

Wilhelm, G. S. and L. A. Masters (1995). Floristic Quality Assessment in the Chicago Region and Application Computer Programs, Morton Arboretum, Lisle, IL. 17 pp. + Appendices.

Chicago District Corps of Engineers. Beta Version of the Chicago Region Floristic Quality Assessment (FQA) Calculator, January 2014. Excel Format.

Standard Wetlands

Isolated wetlands that do not meet *either* of the above criteria shall be assigned a standard **wetland** status. The **District** or **authorized municipality** will make the final determination of **wetland** status based upon a review of submitted information and, when necessary, upon consultation with outside **wetland** authorities.

Wetland Buffers**Introduction**

Wetland buffers help protect **wetland** function by infiltrating **stormwater**, filtering **sediment**, nutrients, and associated pollutants from surface water **runoff**; moderating the temperature of water bodies; and providing organic matter to the **wetland**. Buffers also provide beneficial habitat for wildlife and plant species, and serve as corridors and pathways for movement of species between fragmented habitats. **Wetland buffers** apply to WMO regulated **isolated wetlands**.

Minimum Wetland Buffer Widths

Minimum **wetland buffers** widths for **isolated wetlands** in the WMO are established based upon the **wetland** quality classification (high quality **wetland** versus standard **wetland**). Table 6-4 (Table 3 in the WMO) provides this information.

Table 6-4. Wetland Buffer Determination for Isolated Wetlands

Wetland Quality	Acreage	§603.9(A)	§603.9(B)	§603.8(C)
Standard Isolated Wetland	≥ 0.1 to < 0.5 acre	30 ft.		
	≥ 0.5 acre		50 ft	
High Quality Isolated Wetland	No minimum			100 ft

Minimum **wetland buffer** widths are also depicted in Figure 6.10. **Wetland buffer** widths in the WMO meet the **Corps** minimum standards for **jurisdictional wetland buffers**.

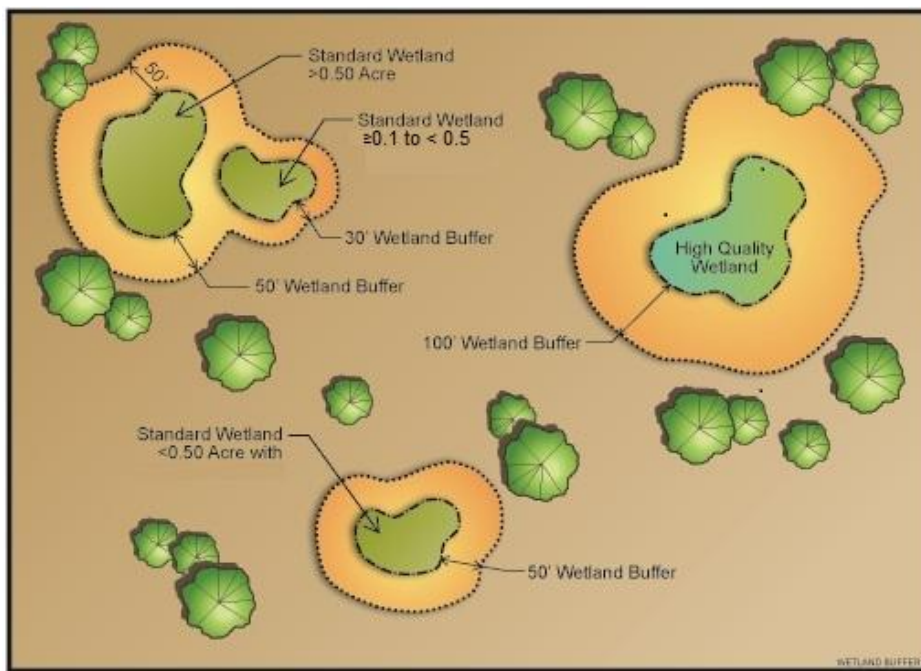


Figure 6.10. Depiction of Minimum Wetland Buffer Widths as Determined by Type of Isolated Wetland

DEVELOPMENT AFFECTING THE FUNCTION AND VALUES OF WETLANDS AND WETLAND BUFFERS (§604)

Introduction

The WMO regulates the direct and indirect impacts to **isolated wetland** and the corresponding buffer. The standards in §604 of the WMO are specific to the completed **wetland** determinations and **wetland** classifications. Table 6-5, taken from the WMO (§604.1) provides a

matrix identifying the applicable sections of the WMO for **wetland** and buffer impact requirements:

Table 6-5. Wetland Impact Matrix

Wetland Type	Wetland Area	WMO Section			
		§604.2	§604.3	§604.4	§604.5
Corps Jurisdictional Wetland	Any	X			
Standard Isolated Wetland	< 0.10 acre				x
	≥ 0.10 acre			x	
High Quality Isolated Wetland	Any		X		

Though the WMO does not regulate **Corps jurisdictional wetlands**, the co-applicant must provide a copy or copies of permits issued for impacts to **Corps jurisdictional wetlands** and waters to the **District** or **authorized municipality**. Specifically, **development** that impacts onsite **Corps jurisdictional wetlands** shall be prohibited unless a permit for all regulated activities is obtained from the appropriate federal and state authorities (WMO §604.2).

Wetland Avoidance and Minimization Documentation

Impacts to High Quality Isolated Wetlands

Impacts to **high quality isolated wetlands** are prohibited unless the co-applicant can demonstrate that the presence of **high quality isolated wetlands** precludes all economic use of the **site** and that no practicable alternative to **wetland** modification exist; or the avoidance of **high quality isolated wetlands** would create a hazardous road condition and that no practicable alternative to **isolated wetland** modification exists (§604.3 of the WMO). The process for completing Practicable Alternatives determinations has been defined by the federal government, and these procedures are now used throughout all levels of government to determine whether or not a project is permissible. Below are the definitions of Practicable Alternative and Alternatives Analysis. These definitions are based on guidance prepared by the Federal Government under the Clean Water Act.

Practicable Alternative: A **development** that is available and capable of being completed after taking into consideration cost, existing technology, and logistics in light of the overall basic **development** purpose. A study of practicable alternatives should consider possible alternative **sites**, a reduction in the scale of the **development** and rearrangement of the proposed facilities. This study assesses actions such as fill **site** locations, partial and full avoidance of habitats, and restoration and enhancement of habitats and **development** economics. See also **alternatives analysis**.

Alternatives Analysis: *The process of comparing and evaluating two or more courses of action of the various technical aspects of a **development** with the intent of selecting the action that best meets the stated Basic **Development** Purpose, while minimizing environmental effects and costs. A practicable alternatives study should consider possible alternative **sites**, a reduction in the scale of the **development** and rearrangement of the proposed facilities. This study assesses actions such as fill **site** locations, partial and full avoidance of habitats, and restoration and enhancement of habitats and **development** economics.*

Federal Guidance

The USEPA prepared a document, Memorandum: Appropriate Level of Analysis Required for Evaluating Compliance with the Section 404(b)(1) Guidelines Alternatives Requirements.

*“The purpose of this memorandum was to clarify the appropriate level of analysis required for evaluating compliance with the Clean Water Act Section 404(b)(1) Guidelines’ (Guidelines) requirements for consideration of alternatives. 40 CFR 230.10(a). Specifically, this memorandum describes the flexibility afforded by the Guidelines to make regulatory decisions based on the relative severity of the environmental impact of proposed discharges of dredged or fill material into **waters of the United States.**”*

*“The fundamental precept of the Guidelines is that discharges of dredged or fill material into **waters of the United States**, including **wetlands**, should not occur unless it can be demonstrated that such discharges, either individually or cumulatively, will not result in unacceptable adverse effects on the aquatic ecosystem. The Guidelines specifically require that “no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences.” 40 CFR 230.10(a). Based on this provision, the applicant is required to evaluate opportunities for use of non-aquatic areas that would result in less adverse impact on the aquatic ecosystem. A permit cannot be issued, therefore, in circumstances where a less environmentally damaging practicable alternative for the proposed discharge exists (except as provided for under Section 404(b)(2)).”*

The Federal Guidance speaks of the discharge of material into waters of the US or **wetland**, because in reality dredging on its own is not a Federal regulated activity. But in regards to **Cook County** that activity is regulated, and the evaluation is completed following the spirit of the Federal process.

The Guidelines, as well as the WMO, do not require the same intensity of analysis for all types of projects, but instead envisions a correlation between the scope of the evaluation and the potential extent of adverse impacts on the aquatic environment.

Minor impacts are associated with activities that generally would have little potential to degrade the aquatic environment and include one, and frequently more, of the following characteristics: are located in aquatic resources of limited natural function, are small in size and cause little direct impact, have little potential for secondary or cumulative impacts, or cause only temporary impacts.

It is important to recognize, however, that in some circumstances even small or temporary fills could result in substantial impacts, and that requires a more detailed evaluation.

It is important to note that it is not acceptable for a reviewer to consider compensatory mitigation in making a determination as to whether or not a proposed discharge will cause only minor impacts for purposes of the practicable analysis required.

In reviewing projects that have the potential for only minor impacts on the aquatic environment, Co-applicants and reviewers should consider the following factors:

- i. Such projects by their nature should not cause or contribute to significant degradation individually or cumulatively. Therefore, it generally should not be necessary to conduct or require detailed analyses to determine compliance.
- ii. Although sufficient information must be developed to determine whether the proposed activity is in fact the least damaging practicable alternative, the Guidelines do not require an elaborate search for practicable alternatives if it is reasonably anticipated that there are only minor differences between the environmental impacts of the proposed activity and potentially practicable alternatives.

This decision will be made after determining whether potential alternatives would result in no identifiable or discernible difference in impact on the aquatic ecosystem. Those alternatives that do not have a discernible difference may be eliminated from further analysis. Because evaluating practicability is generally the more difficult aspect of the alternatives analysis, this approach should save time and effort for both the applicant and the **District** or **authorized municipality**. By initially focusing the alternatives analysis on the question of impacts on the aquatic ecosystem, it may be possible to limit (or in some instances eliminate altogether) the number of alternatives that have to be evaluated for practicability.

-
- iii. When it is determined that there is no identifiable or discernible difference in adverse impact on the environment between the applicant's proposed alternative and all other practicable alternatives, then the applicant's alternative is considered as satisfying the requirements.
 - iv. Even where a practicable alternative exists that would have less adverse impact on the aquatic ecosystem, the Guidelines allow it to be rejected if it would have other significant adverse environmental consequences. This allows for consideration of evidence of damages to other ecosystems in deciding whether there is a 'better' alternative." Hence, in applying the alternatives analysis required by the Guidelines, it is not appropriate to select an alternative where minor impacts on the aquatic environment are avoided at the cost of substantial impacts to other natural environmental features (e.g., removal of quality woodlands to further minimize **wetland impact**).
 - v. In cases of negligible or trivial impacts (e.g., small discharges to construct individual driveways), it may be possible to conclude that no alternative location could result in less adverse impact on the aquatic environment. In such cases, it may not be necessary to conduct an offsite alternatives analysis but instead require only any practicable onsite minimization.

A reasonable, common sense approach in applying the requirements with sound environmental protection: The WMO contemplates that reasonable discretion should be applied based on the nature of the aquatic resource and potential impacts of a proposed activity in determining compliance with the Practicable Alternatives test.

Hazardous conditions: **Development** that impacts onsite high-quality **wetlands** shall be prohibited unless documentation is submitted that demonstrates that avoidance of high-quality **wetlands** itself would create a hazardous road condition, and that no practicable, safe alternative to **wetland** modification exists. Safety issues often arise associated with certain types of projects, especially roadway **developments**. It is important that unsafe alternatives do not fulfill the basic project purpose. However, an option that meets accepted standards even if it is not the safest option is still practicable.

Based upon a review of the above documentation and any other available resources, the **District** or **authorized municipality** will make the final determination as to whether the proposed high-quality **wetland** modification represents the least amount of **wetland impact** required to allow use of the **parcel** or to mitigate the road hazard. The **District** or **authorized municipality** will then make a determination as to whether the request is permissible.

Impacts to Standard Isolated Wetlands greater than 0.10 acre

§604.4 of the WMO requires documentation as to why **standard isolated wetlands** that are

equal to or greater than 0.10 acre in aggregate cannot be avoided and why impacts to **wetlands** must occur. The primary goal is that identified **isolated wetlands** should be avoided; if the **isolated wetland impact** cannot be avoided, then the impact to the **isolated wetland** must be minimized. The co-applicant must demonstrate that the proposed impact is essential for the **development**, that no alternative practical design could be submitted that would result in less impact to the resource. For further guidance regarding this analysis, refer to the practicable alternatives discussed previously in the **TGM**.

Impacts to Standard Isolated Wetlands less than 0.10 acre

For each **standard isolated wetland impact** with a surface area (including adjoining **isolated waters**) of less than 0.10 acre, no documentation of a practicable alternatives is required to support the proposed impact (§604.5). The impacts are automatically acceptable and no practicable alternatives evaluation must be completed. **Wetland mitigation** is required only if the total combined area(s) of **isolated wetland impact** exceeds 0.10 acre.

The cumulative total acreage refers to the acreage of the **wetland(s)** and **contiguous isolated waters**, that when their acreages are combined is less than 0.10 acre. Figure 6.11 demonstrates this concept.

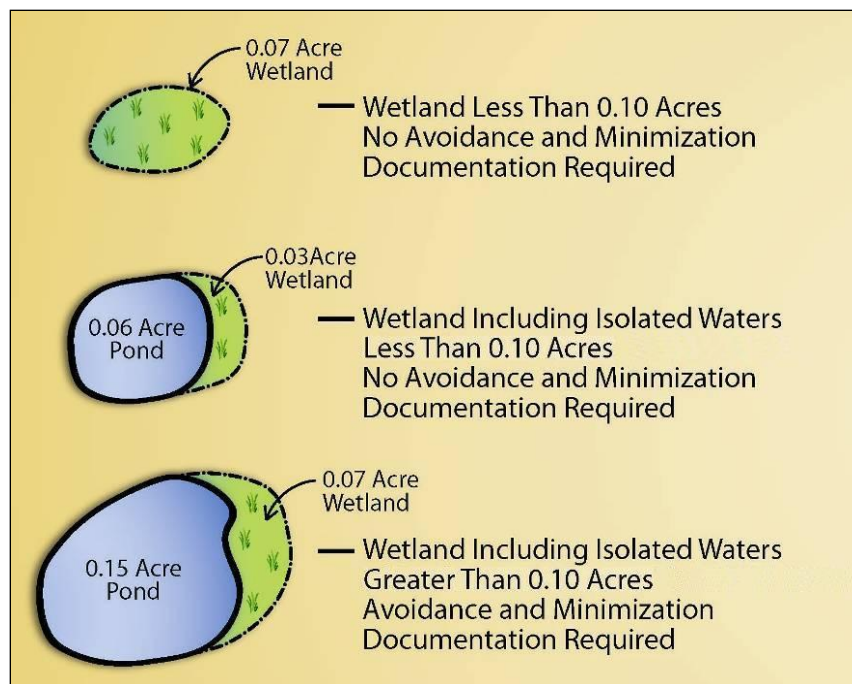


Figure 6.11. Examples of When Documentation is Required Depending on Wetland Acreage

Indirect Wetland Impacts

Activities that occur outside of the identified **wetland** boundaries that alter **wetland** hydrologically are considered to be Indirect **wetland impacts**. Specifically, an **indirect wetland impact** is assumed if the **development** activity causes the **wetland hydrology** to fall below 80%, or to exceed 150%, of the existing condition **storm event runoff** volume to the **wetland** for the

2-year, 24-hour **storm event**. Indirect environmental impacts to **isolated wetlands** must be sufficiently evaluated, minimized, and mitigated (§604.6 of the WMO).

Changes in **hydrology** includes evaluation of increases or decreases in flow, volume, or duration to all identified onsite and offsite **wetlands**. Existing **hydrology** must be maintained as close to 100% as possible during and following construction. An indirect **wetland hydrology** impact shall be assumed to occur if the **development** activity causes the **wetland hydrology** to fall below 80% or to exceed 150% of the existing condition **storm event runoff** volume to the **wetland** for the 2-year, 24-hour **storm event**.

Professional judgment should be taken when evaluating indirect hydrologic impacts. **Wetlands** are highly variable, and calculations in the spreadsheet may not always represent the actual indirect impact to all types of **wetlands**.

Written permission from adjacent property **owners** is required when increased or decreased **hydrology** outside of the 80% to 150% limits is proposed to **wetlands** that are also located on their property.

Detention in Wetlands

The WMO allows **site runoff** storage in **standard isolated wetlands** only (§604.7 of the WMO). This storage allowance does not include temporary detention nor **sediment basins** for **erosion** and **sediment** control. The **hydrology** of the **standard isolated wetland** must be maintained as close as possible to 100%. Proposed detention in a **standard isolated wetland** will only be permitted if it can be demonstrated that the **wetland hydrology** will not fall below 80%, nor will it exceed 150% of the existing condition **storm event runoff** volume to the **wetland** for the 2-year, 24-hour **storm event**.

Detention in any **high quality isolated wetlands** or **Corps jurisdictional wetlands** is not allowed if prohibited by the **Corps** as part of a permit process.

Stormwater Outlets Discharging to Wetlands

Stormwater outlets discharging into a **wetland** will only be allowed provided that appropriate water quality and **erosion control practices** are installed, and that the outlets are proposed to have appropriately designed energy dissipation, such as a level spreader, vegetated swale, or scour protection (§604.8 of the WMO). Project designers are recommended to prepare designs in accordance with the **Illinois Urban Manual** and **IEPA–NPDES** requirements. Please refer to Article 4 for additional requirements regarding design and implementation.

Stormwater outlets discharging into a **wetland** must not result in adverse direct (§604.3, §604.4 or §604.5 of the WMO) or indirect **wetland impacts** (§604.6 of the WMO).

Wetland Mitigation for Impacts to Isolated Wetlands

Introduction

Wetland mitigation for impacts to **standard isolated wetlands** and **high quality isolated wetlands** is only considered an option after the **District** or **authorized municipality** has determined that the applicant has avoided and minimized impacts to **isolated wetlands** to the extent practicable. For **high quality isolated wetlands**, the applicant must satisfy the requirements contained in §604.3 of the WMO. Mitigation is required for **isolated wetland impacts** to replace lost **wetland** function. **Isolated wetland mitigation** shall be completed in accordance with the following criteria:

1. When the cumulative total **standard isolated wetland(s)** impact is less than 0.10 acre, no mitigation is required;
2. When the cumulative total **Standard isolated wetland(s)** impacts are equal to or greater than 0.10 acre, mitigation shall be provided at a ratio of one-and-one-half acre of creation for each acre impacted (1.5:1);
3. High-quality **isolated wetlands** shall be mitigated at a ratio of three acres of creation for each acre impacted (3:1); and
4. **Isolated wetland impacts** initiated after the effective date of the WMO and prior to issuance of a **Watershed Management Permit**, or other unauthorized impact shall be mitigated at a ratio of three acres of creation for each acre impacted (3:1).

Wetland Mitigation Ratios

Mitigation for **developments** that impact an **isolated wetland** shall provide for the replacement of the lost **wetland** environment according to Table 6-6:

Table 6-6. Isolated Wetland Mitigation Requirement Ratios

Wetland Quality	Area of Impact	§604.9 (A)	§604.9 (B)	§604.9 (C)	§604.9 (D)
Standard Isolated Wetland	< 0.10 acre	None			
	≥ 0.10 acre		1.5:1		
High-Quality Isolated Wetland	Any			3:1	
Impacts Prior to Issuance of Permit					3:1

Acceptable Isolated Wetland Mitigation Credit Options

The co-applicant can provide the required **isolated wetland mitigation** as follows (§604.10 of the WMO):

1. Payment into a **Corps** approved **wetland mitigation** bank within the same **Watershed**

- Planning Area** as the impact;
2. Payment into a **Corps** approved **wetland mitigation** bank that is closest to the **development** within the same **Corps** Watershed Service Area as the impact as shown in Appendix D of the WMO;
 3. Enhancement of an existing onsite **isolated wetland** from a **standard isolated wetland** to a **high quality isolated wetland**, subject to §604.14 of the WMO;
 4. Expansion of an existing onsite **isolated wetland**;
 5. Onsite **wetland mitigation**; and
 6. Offsite **wetland mitigation** within the same **Watershed Planning Area** as the impact.

Wetland Creation Onsite or OffSite

Creation of **wetlands** for mitigation of **development** impacts, within or affecting a **wetland**, may take place only within areas that are not currently **wetlands** (§604.13 of the WMO). The design, analysis, and construction of all **wetland mitigation** shall comply with all applicable federal, state, and local regulations. The Joint **Corps** and Environmental Protection Agency regulation, "Compensatory Mitigation for the Losses of Aquatic Resources (June 2008)," shall be used for mitigating impacts. **Wetland** creation can take place on the **development site** or at another approved location.

Existing Wetland Enhancement

The **District** or **authorized municipality** may allow the enhancement of an existing **wetland** that is within or adjacent to a proposed on- or offsite **wetland mitigation** area in exchange for a partial reduction in the mitigation acreage required (§604.14 of the WMO). Either the **District** or an **authorized municipality** may reduce the total **wetland mitigation** area required by 0.75 acre for every one acre of **wetland** enhancement; however, the area of creation of new **wetlands** to compensate for unavoidable **wetland** loss shall not be allowed to fall below a ratio of one acre of creation for each acre impacted (1:1). **Corps** approval of the proposed enhancement to **Corps jurisdictional wetlands** is required if the co-applicant proposes to obtain enhancement credit in lieu of **wetland mitigation** credit.

Wetland Mitigation Plan

If **isolated wetlands** are proposed to be impacted and mitigated on the **development site**, a **wetland mitigation** plan must be prepared and submitted by the co-applicant (§604.15 of the WMO). The mitigation plan shall include design, construction, monitoring, and **maintenance** of the mitigation measures.

The **wetland mitigation** plans must include sheets that depict the location and extent of the proposed **wetland mitigation** area, impacted **wetlands**, planting zones, planting and grading specifications, soil **erosion** and **sediment** control, and temporary and permanent access locations. A summary table shall be included that tabulates the **isolated wetland** acreages to be disturbed (by classification), mitigation ratios, area by classification to be mitigated, and the total mitigation area acreage. If applicable, the mitigation plan should include the proposed buffer and **riparian environment** mitigation plans and associated supporting documentation.

A narrative description of the proposed plan must be provided that describes the proposed **wetland hydrology**, soil characteristics, the proposed plant communities, and any other local geomorphologic conditions that impact the construction or long term sustainability of the **wetland**.

The mitigation plan shall include specifications for construction. These include but are not limited to: specifications for rough and final grading, soil types, soil handling methods, water control **structures**, plant materials, scientific and common names, rates of seeding or spacing, source, storage, and installation methods.

The **maintenance** plan shall at a minimum include a description of each **maintenance** task proposed and its expected effect, the means of measuring its success, and an annual work schedule including the time of year each task will be performed. A checklist for the mitigation plan sheets and **maintenance** plan is provided in Article 3.

If **wetland mitigation** is required, a **wetland mitigation** document must be prepared by the applicant that includes all required information for the **wetland mitigation** and **maintenance** and monitoring submittals. The **wetland mitigation** document must include the following:

1. Proposed **wetland hydrology** and an inundation and duration analysis;
2. Proposed soils and soil management activities;
3. Proposed planting zones, species, quantities, sizes, locations, specifications, methodologies, and details;
4. Proposed **maintenance** and monitoring plan with **maintenance activities** and performance criteria outlined;
5. Schedule of earthwork, planting, monitoring, and **maintenance**;
6. A plan for the continued management, operation, and **maintenance** of the **wetland mitigation** measures including the designation of funding sources and the **person** responsible for long-term operation and **maintenance**; and
7. A description of applicable temporary and permanent access and **maintenance** and conservation easements granted or dedicated to and accepted by a governmental entity.

Wetland Mitigation Plan Approval

Isolated wetland Impacts may not occur until after the mitigation plan has been approved by the **District** or **authorized municipality** (§604.16 of the WMO).

Annual Wetland Monitoring Reports

The WMO requires that the applicant provide the **District** or **authorized municipality** with annual monitoring reports documenting the status of the constructed mitigation measures for five years, or until such time that the performance criteria has been met (§604.18 of the WMO). The **District** or **authorized municipality** may also require the applicant to undertake remedial action to bring the area into compliance with the mitigation plan. Changes to the mitigation,

maintenance, and monitoring plan shall be approved by the **District** or **authorized municipality** as necessary.

The monitoring plan shall establish performance standards for the **wetland mitigation**. Performance standards are predetermined goals for guiding and measuring mitigation success. The monitoring plan shall identify:

1. The party(s) responsible for monitoring;
2. The data to be collected and reported;
3. The frequency and duration of monitoring;
4. The assessment tools and/or methods to be used for data collection; and
5. The format for reporting monitoring data and assessing mitigation success based upon the proposed performance standards.

Monitoring Reports should contain at a minimum the following information:

- Copies of the mitigation plans and if available, as-built plans;
- Maps, and photographs to illustrate **site** conditions;
- Results of functional, condition, or other assessments used to provide quantitative or qualitative measures of the functions provided by the compensatory mitigation project.

Isolated Wetland Buffer Mitigation

Development within an **isolated wetland buffer** shall not, without mitigation (§604.19 of the WMO):

1. Adversely change the quantity, quality, or temporal and areal distribution of flows entering any adjacent **wetlands** or waters;
2. Adversely affect any **groundwater** infiltration functions; or
3. Destroy or damage vegetation that stabilizes **wetland** fringe areas or provides overland flow filtration to **wetlands**. The removal of invasive vegetation is not considered to be destruction or damage of vegetation.

Impacts to **isolated wetland buffer** areas shall be mitigated through the replacement or enhancement of impacted function (§604.20 of the WMO). Therefore, information must be provided that documents the function(s) of the existing buffer. Function(s) of the impacted buffer may be mitigated by enhancing the plants and **structure** of the remaining buffer.

The WMO does not state that buffer is to be mitigated on area basis, but replacement on an

acre-for-acre basis is acceptable. This form of mitigation is referred to as buffer averaging. Buffer averaging is a reduction of the width of a buffer in one area while increasing the width in another without reducing the total surface area of the buffer, maintaining the net surface area of buffer (§603.10 of the WMO). Buffer averaging is allowable if the applicant demonstrates that the averaging will not adversely affect **wetland** function and value, and that the buffer is not reduced in any location by more than 50% or to less than 30 feet total. See Figure 6.12 below for an illustration of this concept.

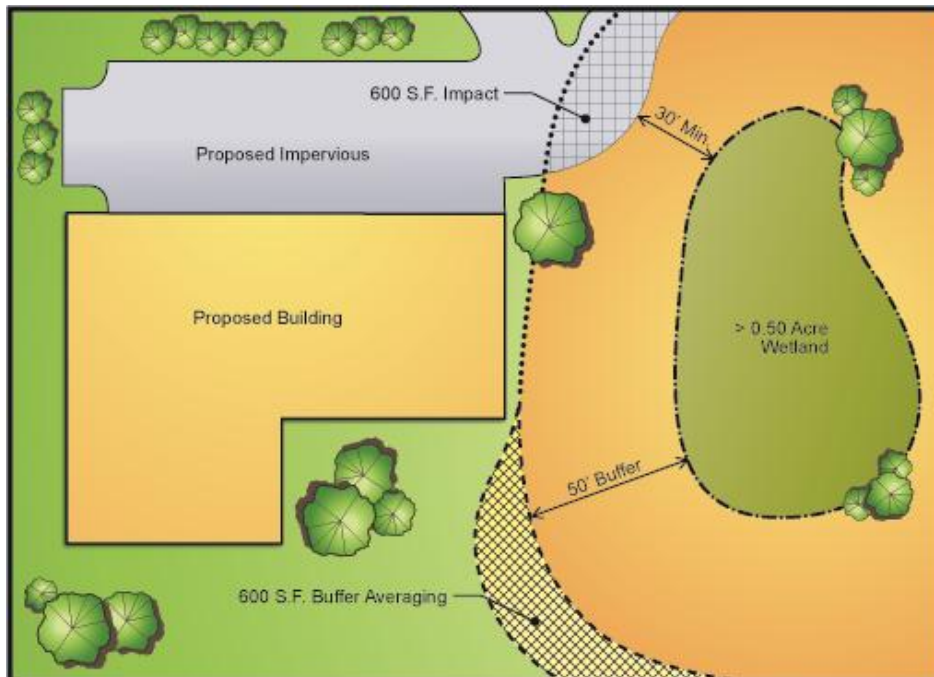


Figure 6.12. Wetland Buffer Averaging

WETLAND BANKING (§605)

When mitigation is provided via **wetland** banking, the Interagency Coordination Agreement (ICA) on Mitigation Banking within the Regulatory Boundaries of Chicago, the **District**, and the **Corps** will be used. The ICA is the guiding document that outlines regulatory requirements for the authorization, management, and monitoring of any proposed **wetland** banks in **Cook County** and surrounding collar counties. The ICA can be viewed on the **Corps** Chicago **District** website.

Isolated wetland mitigation provided through **wetland mitigation** banking shall abide by the following hierarchy (§605.1 of the WMO):

1. Payment into a **Corps** approved **wetland mitigation** bank in the same **watershed planning area**; or
2. Payment into a **Corps** approved **wetland mitigation** bank that is closest to the

development within the same **Corps** Watershed Service Area as the impacts, as shown in Appendix D of the WMO.

Information on **Corps** approved mitigation bank credits within the Chicago **District** Regulatory Branch is available on the *Regional Internet Bank Information Tracking System* (RIBITS). RIBITS was developed for use by **Corps** nationwide to aid in tracking mitigation bank credit and other information. An applicant can determine if mitigation credit is available from any bank noted as “approved.” Information regarding RIBITS can be found at RIBITS:

www.lrc.Corps.army.mil/co-r/ribits.htm.

The payment amount made into the **wetland mitigation** banking program will be determined by multiplying the acres of required mitigation by the banking cost quoted by the mitigation banker on a per acre credit basis (§605.2 of the WMO).

Wetland mitigation banking credits for **jurisdictional wetlands** shall be approved by the **Corps** (§605.3 of the WMO). Credits purchased for **jurisdictional wetland impacts** cannot be applied simultaneously to mitigate for **isolated wetland impacts**.

The **Corps** will have the sole authority for approving **wetland mitigation** banks (§605.4 of the WMO). The **District** or an **authorized municipality** will accept credits purchased from **Corps** approved banks for impacts to **isolated wetlands** regulated by the WMO.

RIPARIAN ENVIRONMENTS REQUIREMENTS (§606)

Introduction

Similar to **wetland buffer** areas, **riparian environments** may help to: reduce **flood** flowrates and volumes, provide bank **stabilization**, pollutant assimilation, **sediment** filtration, stream shading, and wildlife habitat functions.

The **Corps** has the authority under Section 404 and Section 10 of the CWA to regulate **riparian environments** that are located within the limits of delineated **Jurisdictional Waters of the US** or **wetlands** when a **Corps** permit is required.

Unlike **wetlands**, the **Corps** and other federal agencies have not defined **riparian environments**. Research by a number of organizations has led to numerous definitions of a **riparian environment**. The WMO defines a **riparian environment** as follows:

*The vegetated area between aquatic and upland ecosystems adjacent to a **waterway** or body of water that provides **flood** management, habitat, water quality enhancement, or other amenities dependent on the proximity to water.*

The WMO also states that “adverse impacts to the existing functions of a **riparian environment** shall be mitigated and a mitigation plan shall be prepared” (§607.4).

Waters that are exempt from regulation are likewise exempt from having riparian habitat (§606.3 of the WMO) as listed below.

1. Roadside ditches created by excavation for the purposes of **stormwater** conveyance;
2. Channels or bodies of water created by unfinished **development** activities; or
3. Channels or bodies of water created by the construction of **stormwater facilities** in upland areas for the purposes of **stormwater** management.

It is important to clarify that **stormwater facilities** constructed in hydric soils (non-upland areas) may be considered waters and may therefore provide a riparian habitat.

Development that Impacts Jurisdictional Waters of the US

Waters of the US and **wetlands** are regulated by the **Corps** under Section 404 of the Clean Water Act and other local municipal ordinances; **wetlands** are regulated by the State of Illinois under the Illinois Interagency **Wetlands** Policy Act (IWPA). WMO regulated **riparian environments** located within areas regulated by other agencies cannot commence until permits from the applicable agencies have been obtained and copies provided to the **District** or **authorized municipality**.

Protection of Existing Functions of a Riparian Environment

The WMO requires the protection of the existing functions of a **riparian environment**. Protection of the **riparian environment** functions pertains to the functions of the onsite **riparian environment**. Similar to the **wetland** requirements, the phrasing of “to the extent practicable” is understood as a solution that is feasible to implement after taking into consideration cost, existing technology, and logistics in light of the overall purpose of the **development** (see the avoidance and minimization sequencing discussion in the **TGM**).

Requirements for Development That Affect the Function and Values of Riparian Environments

There are three main standards for **development** that impact **riparian environment** functions:

1. **Development** that impacts **Jurisdictional Waters of the US** on the **development site** shall be prohibited unless a permit for all regulated activities is obtained from the appropriate federal and state authorities (§607.1 of the WMO);
2. To the extent practicable, the existing functions of a **riparian environment** shall be protected (§607.2 of the WMO); and
3. Adverse impacts to the existing functions of a **riparian environment** shall be mitigated and a mitigation plan shall be prepared (§607.4 of the WMO).

The **District**, or **authorized municipality** will make the final determination as to whether the proposed **riparian environment** modifications will be permitted pursuant to a review of a riparian area mitigation plan.

Below is the technical guidance related to the **riparian environment** standards in **Cook County**:

1. **Riparian environment** determination;
2. **Riparian environment** functions;
3. **Riparian environment** exemptions;
4. **Riparian environment** mitigation; and
5. **Riparian environment maintenance** and monitoring.

Riparian Environment Determination

Riparian Identification

Any **development** containing **riparian environments** requires the identification of the boundaries or limits of those **riparian environments** and the determination of the **riparian environment** function. The limits of **riparian environments** are measured from a stream or **waterway's Ordinary High Water Mark (OHWM)** to 30, 50, or 100 feet inland, depending on the stream or **waterway** classification. Within these boundaries, the functional value of the existing vegetation must be assessed.

Because it is the *function* of the **riparian environment** that should be protected, it is important to distinguish those areas that provide a meaningful function from those areas that do not. From a practical standpoint, the following areas are considered to have low functional benefit and should generally not be considered to be "riparian" as they do not meet the definition of **riparian environments** found in the WMO or found within most resource manuals because (1) they are not effective at providing habitat or water quality enhancement and (2) they are man-made ecotypes:

- Paved or graveled surfaces;
- Buildings/structures; and
- Manicured/maintained lawns or formal landscape beds.



Figure 6.13. Examples of Riparian and Non-riparian Environments

Boundaries of Riparian Environments

*Determining **Biological Stream Characterization** and Waters Classification*

Riparian environments adjacent to streams and **waterways** are considered based on the classification of the **waterway** including:

- **Biological Stream Characterization (BSC)** of “A” or “B”;
- **Biologically Significant Stream (BSS)**; and
- **Jurisdictional Water of the US.**

The **waterways** classification can be determined by referring to latest edition of the **Illinois Environmental Protection Agency’s Biological Stream Ratings for Diversity, Integrity and Significance** found at the following website:

<http://www.dnr.illinois.gov/conservation/BiologicalStreamratings/Pages/default.aspx> .

Determining Limits of Riparian Environment

Table 6-7, taken from the WMO, summarizes the **riparian environment** determinations.

Table 6-7. Riparian Environment Determination

Biological Stream Characterization	Waters Classification	WMO Section		
		§606.2 (A)	§606.2 (B)	§606.2 (C) or (D)
All other streams	Jurisdictional Water of the US	50 feet from the OHWM		
	Isolated Waters		30 feet from the OHWM	
BSC of “A” or “B” or BSS streams	Jurisdictional Water of the US			100 feet from the OHWM
	Isolated Waters			100 feet from the OHWM

Figure 6.14 shows the 50-foot **riparian environment** for a **Jurisdictional Waters of the US** that does not qualify as **wetlands**.

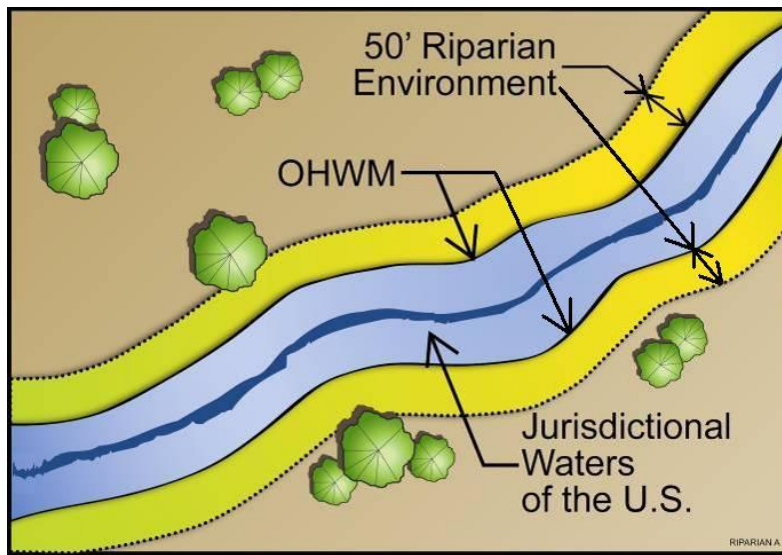


Figure 6.14. Riparian Environment for a Jurisdictional Waters of the US that does not Qualify as Wetlands

Figure 6.15 shows the 30-foot **riparian environment** for an **isolated waters** that does not qualify as **wetlands**. The **riparian environment** shall be 30 feet from the **OHWM**.

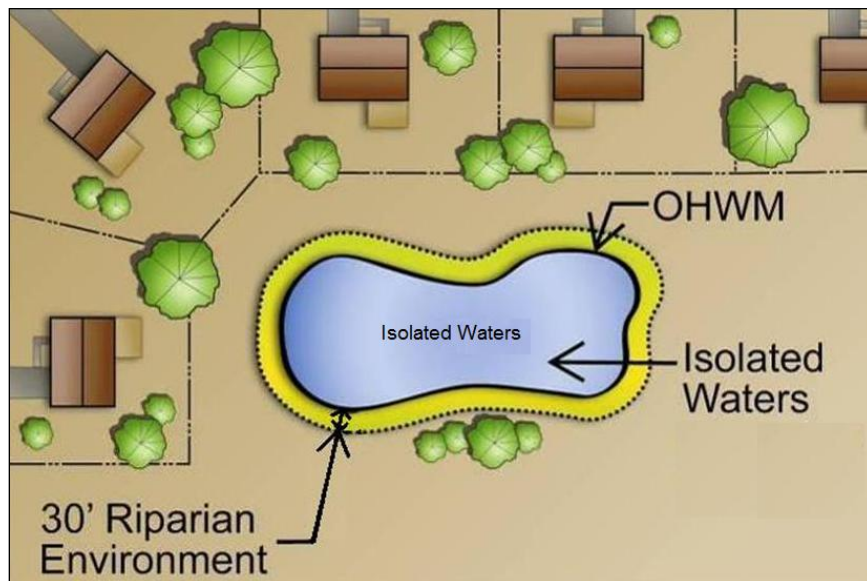


Figure 6.15. Riparian Environment for an Isolated Waters that does not Qualify as Wetlands

The limit of the **riparian environment** is 100 feet from the **OHWM** for any **Jurisdictional Waters of the US** or for any **isolated waters** that do not qualify as **wetlands** and which are identified as:

- **Biological Stream Characterization (BSC)** of "A" or "B" according to the latest edition of the **Illinois Environmental Protection Agency's Biological Stream Characterization: Biological Assessment of Illinois Stream Quality**.
- **Biologically Significant Stream (BSS)**, which is a stream with a Biological Diversity or Integrity of "A", "B", or "C" according to the latest edition of the Illinois Department of Natural Resource's (IDNR) Office of Resource Conservation: *Biological Stream Ratings for Diversity, Integrity and Significance*.

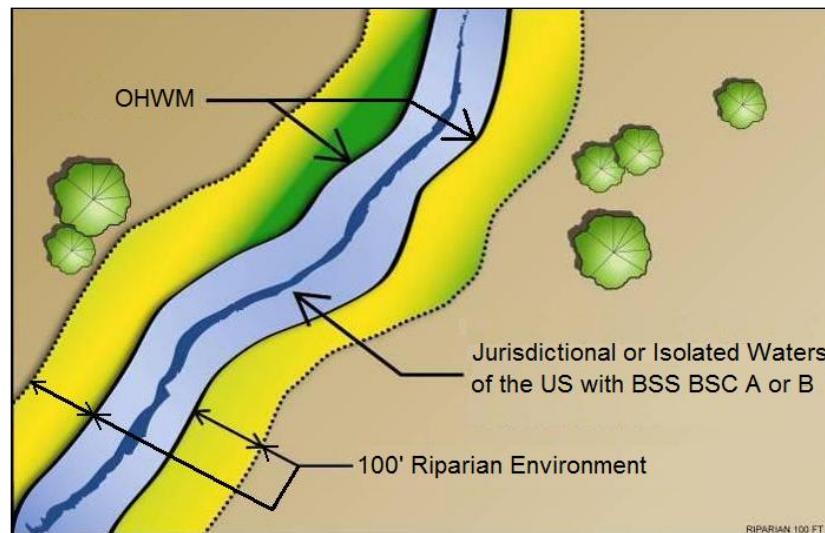


Figure 6.16. Riparian Environment Limits for Streams with a BSC Classification of "A" or "B" and BSS streams

The Illinois Department of Natural Resources - Office of Resource Conservation *Biological Stream Ratings for Diversity, Integrity and Significance* is available at:

www.dnr.state.il.us/orc/BioStrmRatings/

Riparian Environment Functions

Riparian environments are defined in two ways, by function and proximity to waters of the US and **isolated waters** (§606.1 of the WMO). It is the function of the **riparian environments** that is to be protected. It is the responsibility of the co-applicant to document the functions that each identified **riparian environment** has on the **development site**.

The following provides examples of riparian functions that should be considered.

- Reducing **flood** flowrates, velocities, and volumes;
- Minimizing **erosion** and promoting bank stability of streams, **lakes**, ponds, or **wetland** shorelines;
- Helping to control **sediment** from upland areas by filtering and assimilating nutrients

discharged from surrounding uplands;

- Has overhanging vegetation that helps to cool stream flow; and/or
- Providing nutrient uptake that may reduce algal blooms and subsequent depressed levels of dissolved oxygen in-stream.

The presence and extent of **riparian environments** are to be identified by the permit applicant. The applicant should identify the function and quality of **riparian environments**. If a **riparian environment** is present on the subject **parcel**, the applicant is encouraged to obtain the assistance of an environmental scientist to delineate the boundaries of the **OHWM**. The **Corps** maintains a list of consultants who perform these services. Inclusion on this list does not constitute a recommendation, endorsement, or certification of its qualifications or performance record.

Exempt Riparian Areas

Some areas that meet the requirements to be considered **riparian environments** are exempt from regulation because they are manmade. Areas that were excavated out of upland conditions or created by artificial **hydrology** are generally not regulated by the WMO as a **riparian environment** (§606.3 of the WMO). While man-induced waters may not be regulated under the WMO, they may be regulated by other federal, state, or local **municipalities**. The **Corps** and USEPA reserve the right on a case-by-case basis to determine that a particular water body is a **Jurisdictional Waters of the US**.

The following **riparian environments** are exempt from the **riparian environment** requirements of the WMO:

1. Roadside ditches created by excavation for the purposes of **stormwater** conveyance;
2. Channels or bodies of water created by unfinished **development** activities; and
3. Channels or bodies of water created by the construction of **stormwater facilities** for the purposes of **stormwater** management.

RIPARIAN ENVIRONMENT MITIGATION (§607)

Definition of Adverse Impacts

Adverse impacts to the function of **riparian environments** must be mitigated. Appropriate mitigation must be included in a **site** mitigation plan, which is part of the permit submittal (§306 of the WMO).

Adverse impacts to **riparian environment** functions are defined as:

1. Modification or relocation of streams and channels;
2. Significant changes to quantity, quality, or distribution of flows draining to any adjacent

wetlands or waters; and

3. Damage to vegetation that overhangs, stabilizes, provides overland flow filtration, or shades stream channels, **wetlands**, or impoundments that normally contain water.

The removal of invasive vegetation is not considered to be destruction or damage of vegetation. The removal of vegetation and downed trees impeding drainage or removal of invasive vegetation is excluded from the WMO requirements when included as part of a **District** recognized program or project for stream **maintenance, stabilization**, restoration, or enhancement.

Riparian Environment Mitigation

Impacts to **riparian environments** are mitigated through the replacement or enhancement of impacted functions and values. Therefore, a narrative must be provided that identifies the existing **riparian environment** functions.

Mitigation Approaches

The functions of the impacted **riparian environment** may be mitigated by enhancing the functions and values of the remaining **riparian environment**. For example, if the existing **riparian environment** were a fallow field and provided limited soil **stabilization, sediment** filtration, and pollutant assimilation functions, those functions could be enhanced by re-vegetating the remaining **riparian environment** with native deep rooted vegetation that increases the soil **stabilization, sediment** filtration, and pollutant assimilation functions.

Riparian environment averaging may also be used to mitigate impacts. Averaging is reducing the width of the **riparian environment** in one area while increasing the width in another without reducing the aggregate area. This is allowable if the applicant demonstrates that the averaging will not adversely affect the **riparian environment** functions and values and that the **riparian environment** width is not reduced in any location by more than 50% or to less than 30 feet. Figure 6.17 illustrates this concept:

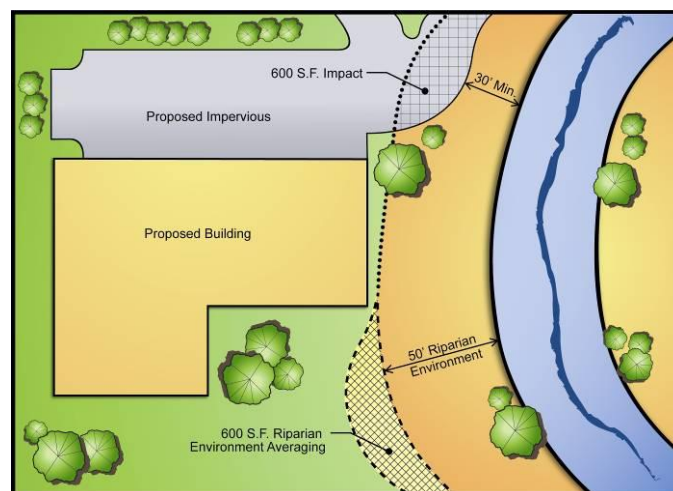


Figure 6.17. Riparian Environment Averaging

Channel Relocation and Stabilization Practices

The following requirements pertain to channel relocation and **stabilization** practices:

Avoidance of Impacts to Natural Streams and Channels

When practicable, impacts to natural streams and channels should be avoided. Natural streams and channels provide greater benefits than urban hard-armored streams and channels. Therefore, the WMO requires avoidance of these areas.

Similar to the **wetland** requirements, the phrasing of “when practicable” is understood as available and being capable of being implemented after taking into consideration cost, existing technology, and logistics in light of the overall purpose of the **development** (see the avoidance and minimization sequencing discussion in §604). However, natural streams and channels have often been degraded due to **erosion** from urban **runoff**. Therefore, stream restoration and enhancement projects are exempt from this requirement, as the goals of these projects are to provide enhanced functions and values.

Naturalizing New or Relocated Channels

If a channel is completely or partially relocated, the newly created portion shall be constructed in a manner which will allow naturalizing to occur, including but not limited to, meandering, pools, or riffles where practicable.

Constructed in Dry Conditions

When feasible, new or relocated channels shall be built under dry conditions through the diversion of the normal flow within the channel. All items of construction (including establishment of vegetation) shall be completed prior to diversion of water into the new channel.

Building new or relocated channels under dry conditions minimizes and controls suspended **sediment** and degradation of downstream water quality.

Erosion and Sediment Control Practices

An approved and effective **erosion** and **sediment control practice** to minimize and control suspended **sediment** and degradation of downstream water quality must be installed before excavation begins. The installed practices must be maintained throughout the construction period and conform to the requirements of WMO Article 4.

There are numerous methods and proprietary products to control **erosion** and **sediment** during construction of streambank **stabilization** projects. Some of these practices include, but are not limited to, **silt fence** at the toe of the slope, turbidity curtains, stream draw down, by-pass pumping, diversion channels, and coffer **dams**. See Article 4 for appropriate **erosion** and **sediment control practices**.

Meeting Channel Modification Requirements

Any channel modifications shall meet all other requirements in the WMO and **TGM**, including the **floodplain** and **floodway** requirements outlined in §601 and §602. See Article 3 for

floodplain and **floodway** submittal requirements.

Length of New or Relocated Channel

The length of any new or relocated channel shall be greater than or equal to the length of the disturbed channel.

Meandering channels are generally longer than straightened channels. Meandering channels can offer more physical stability and physical habitat diversity than are typically found in a straightened stream corridor. This requirement is to ensure that channel straightening does not occur.

Withstanding All Events up to the Base Flood without Increased Erosion

Streams and channels shall be expected to withstand all events up to the **base flood** without increased **erosion**. Hard armoring of banks with concrete, bulkheads, rip-rap, and other non-natural materials shall be avoided where practicable. Hard armoring shall be used only where **erosion** cannot be prevented by use of bioengineering techniques or gradual slopes. Such armoring shall not have any adverse impact on other properties nor shall it have an adverse impact upon the existing land use.

Natural streams and channels provide greater benefits than hard-armored streams and channels. Similar to the **wetland** requirements, the phrasing of “where practicable” is understood as available and being capable of being implemented after taking into consideration cost, existing technology, and logistics in light of the overall purpose of the **development** (see the avoidance and minimization sequencing discussion of the **TGM**). When hard armoring is proposed where **erosion** cannot be prevented by use of approved methods, documentation must be provided showing the need for hard armoring techniques.

Replanting for Stability

All **disturbed areas** must be replanted for stability with native vegetation where appropriate.

Stormwater Outlets Impacting Riparian Environments

Stormwater outlets discharging into a channel shall be designed with appropriate water quality control practices and proper energy dissipation or scour protection. See Article 4 appropriate water quality and **sediment** and **erosion** control measures.

Riparian Environment Mitigation Plan Requirements

A **riparian environment** mitigation plan shall be developed by the applicant and meet the requirements of Article 9. This plan shall include:

1. Mitigation area design;
2. Plan sheets;
3. Construction phasing;

4. A monitoring plan; and
5. A **maintenance** plan.

This plan may be combined with other impact and mitigation plans if **wetland** or buffer impacts are proposed.

Each **riparian environment** mitigation plan must have a drawing that depicts the location and extent of the **riparian environment** mitigation as well as **riparian environment** that is impacted on the **site**, planting zones, and temporary and permanent access locations. A summary table shall be included on this drawing that includes the acreage to be disturbed and the acreage to be mitigated.

The mitigation plan shall include specifications for construction. These include but are not limited to: specifications for rough and final grading, types of soils, soil handling methods, plant materials, scientific and common names, rates of seeding or spacing, source, storage, and installation methods.

The **maintenance** plan shall at a minimum include a description of each **maintenance** task proposed, expected effect, means of measuring its success, and an annual work schedule including the time of year each task will be performed.

The monitoring plan shall establish performance standards for the **riparian environment** mitigation. Performance standards are predetermined goals for guiding and measuring mitigation success. The monitoring plan shall identify the party(s) responsible for monitoring, the data to be collected and reported, how often and for what duration, the assessment tools and/or methods to be used for data collection, and the format for reporting monitoring data and assessing mitigation success based upon the proposed performance standards.

Riparian Environment Monitoring and Maintenance

The **District** or **authorized municipality** will require that the applicant provide the annual monitoring reports on the status of the constructed mitigation measures for five years or until such time that the performance criteria has been met. The **District** or **authorized municipality** may also require the applicant to undertake remedial action to bring the area into compliance with the mitigation plan. Changes to the mitigation, **maintenance** and monitoring plan may be approved by the **District** or **authorized municipality** as necessary.

Mitigation measures in **riparian environments** shall include required provisions for long-term **maintenance**.

Requirements for Outfalls

For all new and reconstructed **outfalls** to any **waterways**, including Lake Michigan, require a **Watershed Management Permit**. For **outfalls** to **waterways** located within the City of Chicago, a **Facility Connection Authorization** is also required.

Each **outfall structure** must be designed with energy dissipation. **Outfalls** constructed within **wetlands, wetland buffer, and riparian environments** will be subject to those applicable requirements of the WMO. The **outfall** and energy dissipation must be designed such that no downstream **erosion** or **flooding** results from the discharge. Article 4 of the WMO requires that the **stabilization** practices be installed as soon as practicable in those portions of the **site** where construction activities have temporarily or permanently ceased.

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