Chapter 6 - Floodplains

6.1 Overview

The goal of floodplain management is to reduce the potential risks to both existing and future developments, and infrastructure, in the 100-year floodplain. Over the years, the philosophy has changed from “keep water from people” by using structural controls to block or direct flood waters, to “keep people from water” through floodplain regulations, public education, design criteria, and other flood loss reduction strategies administered as part of Aspen’s stormwater management program.

This chapter outlines floodplain management guidelines that are intended to ensure that future improvements and developments, including but not limited to, roads, bridges, utilities, residential and commercial developments, do not impact or are not impacted by the floodplain and/or floodway and are in compliance with the National Flood Insurance Program (NFIP). All of the following restrictions and guidelines are part of the NFIP, and are required by the Federal Emergency Management Agency (FEMA), the Colorado Water Conservation Board (CWCB), and the City of Aspen Municipal Code Chapter 8.50.

Floodplain management is a decision-making and regulatory process, the purpose of which is to achieve the wise use of local floodplains. “Wise use” means to define and make choices among often competing demands for floodplain locations. It includes the responsibility to regulate uses that are compatible with, and balance the following goals: (1) minimize risk to human life and risk of property damage, (2) preserve and protect the natural and beneficial functions of floodplains, and (3) allow for economic development where necessary and appropriate.

City floodplain policy is based upon the following principles:

- Protect human life and health.
- Protect the storage capacity of floodplains and assure retention of sufficient floodway area to convey flood flows which can reasonably be expected to occur.
- Protect the hydraulic characteristics of the small watercourses, including gulches, streams, and artificial water channels used for conveying floodwaters.
- Minimize damage to public facilities and utilities located in Special Flood Hazard Areas.
- Minimize expenditure of public money for costly flood control projects.
- Alert potential property buyers that a property is in a Special Flood Hazard Area.
- Ensure that those who occupy the Special Flood Hazard Areas assume responsibility for their actions.
- Minimize the need for rescue and relief efforts associated with flooding that are generally undertaken at the expense of the public.
- Minimize prolonged business interruptions.
- Maintain a stable tax base by providing for the use and development of Special Flood Hazard Areas so as to minimize future flood blight areas.

6.2 Floodplain Development Regulations

One hundred-year (100-year) floodplains consist of the entire area inundated by the 100-year flood. Within the floodplain is the floodway. The floodway is defined as the channel plus any adjacent floodplain areas that must be kept free of encroachment so that the 100-year discharge can be conveyed **with no rise in the water surface above the base flood elevation (BFE)**.

The base flood elevation is the water surface elevation resulting from the 100-year flood. The BFE must be determined using the most updated FIS, not the FIRM.

The City of Aspen regulates FEMA identified floodplains (jurisdictional floodplains) as well as flood areas that have not been identified by FEMA (non-jurisdictional floodplains). The City's regulations follow those of FEMA (in some cases more stringent), unless the area in question is in a City defined 'Stream Margin', in which case the applicant must follow the criteria that offers the most protection.

The purpose of these regulations is to control the alteration of the natural floodplains; prevent or regulate the construction of flood barriers which will unnaturally divert flood waters or which may increase flood hazards in other areas; restrict or prohibit uses which may result in damaging increases in erosion or in flood heights or velocities; protect and preserve the natural riparian corridor; and to control filling, grading, dredging, and other development which may increase flood damages.

The City of Aspen requires that all proposed development and/or redevelopment in the 100-year floodplain, not just construction of buildings, be reviewed and permitted in compliance with this Manual and Chapter 8.50 of the City Code. The Development Engineer administers the ordinance through the issuance of permits, inspection of construction, and collection and maintenance of FEMA Elevation Certificates to show the final elevation of new and substantially improved construction. Note that garages, sheds, additions, athletic courts, driveways, and fill all require permits from City of Aspen Engineering Department.

6.2.1 Jurisdictional Floodplains

Jurisdictional Floodplains are FEMA designated floodplains, also known as special flood hazard areas and the 100-year floodplain. The 100-year floodplain information generated and/or published by FEMA can be found in "The Flood Insurance Study for Pitkin County and Incorporated Areas," dated October 19, 2004, or on the accompanying Flood Insurance Rate Map (FIRM) for Aspen. The FIS and FIRM can be located on the web at www.fema.gov or at the City of Aspen Engineering Department.

6.2.2 Non-Jurisdictional Floodplains

Non-jurisdictional floodplains are flood hazard areas not identified by FEMA. Flood hazard areas are defined as those areas where the potential for flooding poses a potential threat to public health, safety, and welfare. The City of Aspen requires hydrologic and/or hydraulic analysis of the potential flooding for property determined by the City of Aspen, and approved by the Colorado Water Conservation Board, to have potential flood hazards. Criteria for identifying unmapped flood hazard areas includes a drainage area of more than 130 acres, and may also include areas designated as "Zone A" by FEMA, areas with a history of flooding on the property or in the vicinity, and/or other factors.

6.2.3 City of Aspen Stream Margin

Based on the Aspen City Code Section 26.435.010.B; "areas located within one hundred (100) feet, measured horizontally, from the high water line of the Roaring Fork River and its tributary streams or areas within the one-hundred-year floodplain where it extends one hundred (100) feet from the high water line of the Roaring Fork River and its tributary streams are within a Flood Hazard Area (Stream Margin). Development in these areas are subject to heightened review, the Stream Margin Review, and restrictions to reduce and prevent property loss by flood, to ensure the natural and unimpeded flow of watercourses, and to protect and preserve the natural riparian buffer. Review shall encourage development and land uses that preserve and protect existing watercourses and the habitat surrounding those watercourses as important natural features".

6.3 Requirements for Development in Floodplains

A Floodplain Development Permit (see **Appendix D** for a copy of the permit**) is required for any development, redevelopment or construction that will occur within jurisdictional and non-jurisdictional floodplains.** Those activities include, but are not limited to, building or enlarging a structure, remodeling or improving a structure, the placement of a manufactured home, mining, dredging, filling, grading, paving, excavating, and drilling. A Floodplain Development Permit Application must include detailed results from a hydraulic analysis in accordance with FEMA guidelines, that:

- Determines the effects of the proposed improvements on the 100-year flood elevation
- Documents any necessary revisions to the floodplain delineation
- Compares pre-project and post-project conditions

It is a requirement of this Chapter that any development or redevelopment of residential, non-residential, utilities or any other kind of development or construction, review and address how the activity is related to the plans set forth in the 2001 Master Drainage Plan for the City of Aspen.

6.3.1 Floodplain Delineation

Flood hazard areas should be clearly identified, studied, and delineated on proposed project plans in order to regulate improvements and to reduce the amount of losses due to flooding.

The FEMA 100-year floodplains for the Roaring Fork River, Hunter Creek, Castle Creek, and Maroon Creek are delineated on the FIRM for Pitkin County and Incorporated Areas dated June 4, 1987. The FIS and FIRM can be located on the web at www.fema.gov or at the City of Aspen Engineering Department.

Depending on the topography of the property, past history of flooding on the property or in the vicinity, “Zone A” designation, proposed land use for the property, or other factors, the City might require delineation of new floodplain boundaries, cross-sections, base flood elevations, and/or other information in areas where a FEMA designated floodplains do not exist. The new floodplain information should be approved by the Colorado Water Conservation Board as areas of flood hazard.

Floodplain delineation is prepared using topographic maps, hydrologic analysis, and hydraulic calculations.

6.3.2 Hydrologic and Hydraulic Analysis

The City of Aspen requires hydrologic and/or hydraulic analysis of the potential flooding for properties located in FEMA floodplains, properties receiving drainage from more than 130 acres, or as determined by the City of Aspen to have potential flood hazards.

Hydrologic analysis involves the determination of discharge (peak rate of flow) in cubic feet per second, based on a scientific analysis of the physical flow process. Hydraulic analysis involves the determination of flood elevations and velocities based on scientific analysis of the movement and behavior of floodwaters in channels or basins. The following information is required for existing watershed and floodplain conditions (pre) and the conditions after the development (post).

- Hydrologic analysis for the 10-, 50-, and 100-year storm frequency discharges,
- Water surface profiles for the 10-, 50-, and 100-year flood frequencies,
- 100-year floodplain boundary,

- Effects of the proposed improvements on the 10-, 50-, and 100-year flood elevations,
- Calculations that show that the BFE is not increased; and
- Completion of a No-rise Certification (procedures and certificate are located in Appendix D).

6.3.3 Floodplain Modifications and Map Revisions

If modification of a FEMA-designated floodplain is proposed, a floodplain revision request should be submitted to FEMA for their review and approval. The applicant shall submit a request for a Conditional Letter of Map Revision (CLOMR) before the project, and then submit a Letter of Map Revision (LOMR) request upon project completion.

6.3.4 Building in the Floodplain

In order to construct or make improvements to buildings/structures in the 100-year floodplain, the lowest floor of the structure must be elevated to meet or exceed the base flood elevation (BFE) with one foot of freeboard. The BFE must be determined using the most updated FIS, not the FIRM. Prior to issuance of a Certificate of Occupancy, an Elevation Certificate needs to be approved by the Floodplain Administrator for the City.

Development in or near the floodway is prohibited if the encroachment causes rise in the water surface above the BFE.

6.3.4.1 Elevation

New construction and substantial improvement of residential structures must be elevated to the point where the lowest level is at or above the BFE with one foot of freeboard in one of the following three ways:

- Elevation on fill
- Elevation on piles, posts, piers or columns
- Elevation onto a non-livable space such as a crawlspace with flood vents

6.3.4.2 Elevation Certification

An Elevation Certification is an official form of the NFIP that ensures a property's lowest floor is elevated above the base flood elevation. **Both the City and FEMA require that the form be used for new construction and for substantial improvements to existing buildings, both to comply with the ordinance and for the owner to obtain a flood insurance policy.** See **Appendix D** for a copy of FEMA's Elevation Certificate. The form may be completed by a land surveyor, engineer, architect, or local official authorized by ordinance to provide floodplain management information.

6.3.4.3 Critical Facilities

Flooding does occur above and beyond the 100-year floodplain. For that reason, new critical facilities and substantial changes to critical facilities shall be regulated to the 500-year flood event. **New critical facilities should be located outside of the 500-year floodplain and have continuous non-inundated access during a 500-year flood event**. Substantial changes to critical facilities should meet these requirements to the maximum extent possible. Critical facilities that cannot be located outside of the 500-year floodplain will require protection to the 500-year level. "Critical facilities" for floodplain purposes means a facility (structure, infrastructure, equipment, service, etc.) that if flooded may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during, or after a flood. Examples of critical facilities include police, fire, emergency management or responders, hospitals, urgent care, communications facilities, public utilities,

primary access routes or evacuation routes, hazardous materials facilities, gas stations, schools, day cares, senior centers, community centers, etc.

6.3.5 Flood-Proofing and Certification for Non-Residential Structures

As an alternative to elevating a new, substantially damaged or substantially improved non-residential structure above the BFE with one foot of freeboard, that structure can be flood-proofed. A FEMA Flood-proofing Certificate Form is required both by the NFIP, and by an insurance agent for adjustment of flood insurance rates. It is also required that a registered professional engineer or architect certify that the flood proofing measures meet the NFIP design standards, which can be found in the following publications:

- Federal Emergency Management Agency, Flood-Resistant Materials Requirements for Buildings Located in Special Flood Hazard Areas in Accordance with the National Flood Insurance Program, Technical Bulletin 2-93, 1993.

- Federal Emergency Management Agency, Non-Residential Flood proofing – Requirements and Certification for Buildings Located in Special Flood Hazard Areas in Accordance with the National Flood Insurance Program, Technical Bulletin 3-93, 1993.

Two major flood proofing techniques are wet flood proofing (allows water to enter structure) and dry flood proofing (prevents entry of flood waters).

Wet Flood Proofing
Aspen uses wet flood proofing as a flood protection technique only through the issuance of a variance from certain floodplain management requirements. Wet flood proofing refers to measures applied to a building and its contents that prevent or provide resistance to damage from flooding by allowing flood waters to enter the structure.

Dry Flood Proofing
Dry flood proofing refers to sealing the outside of a structure to prevent the entry of flood waters. Oftentimes, this involves covering openings below the flood level, protecting the interior or the house from seepage, and protecting service equipment outside the house. Dry flood proofing must be provided to at least one foot above the BFE.

Relocation
Relocation refers to moving a structure out of the flood hazard area. Although it is the most expensive approach to flood protection, this method offers the greatest defense from flooding. The process of relocation usually involves lifting a house off of its foundation, putting it on a flatbed trailer, hauling it to its new location outside of the flood hazard area, and lowering it into a new, conventional foundation.

Levees and Floodwalls
Levees and floodwalls are structural barriers that hold back flood waters. Levees are embankments of compacted soil and floodwalls are structures built of concrete or masonry. Both levees and floodwalls need to be built at least one foot higher than the BFE.

6.4 Acceptable and Un-acceptable uses in the Floodplain or Floodway

6.4.1 Storage of Materials

It is prohibited to store hazardous or floatable/movable materials in the floodplain. These materials have the potential to create public health, environmental or safety risks. For example, materials stored in the floodplain may become dislodged and roll and/or float downstream to

cause culvert or bridge blockages and resulting overtopping of roadways which can create hazards for vehicles and pedestrians. Materials stored in the floodplain may also cause diversion of flood waters out of the floodplain where damage is possible or may cause undesirable erosion or sedimentation in the floodplain. Storage of some materials in the floodplain and floodway may be permitted based on approval by the Floodplain Administrator.

6.4.2 Permitted Uses

Permitted uses in the floodplain are considered carefully by the Floodplain Administrator so they do not create barriers to flood waters such as fences, walls, berms or other obstructions may create. Based on careful review, possible allowable uses may include; golf courses, bike paths, parks, open spaces, nature areas, greenspace, public stormwater management facilities, and other similar uses. If these uses include cut and fill they will be addressed from the standpoint of their impact on the floodplain.

6.4.3 Uses Not Permitted

Parking lots and sport courts with fences or netting are not permitted uses in Special Flood Hazard Areas.

6.4.4 Utilities

The protection of City and private utilities is very important from the standpoint of protecting the investment in the utilities and providing uninterrupted service to the City:

- All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of floodwaters into the system.
- New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of floodwaters into the system and discharges from the system into floodwaters.
- On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding.
- Electrical, heating, ventilation, plumbing, and air-conditioning equipment and other service facilities shall be designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.

6.5 Floodplains and Mudflows

Floodplains may correspond to or be in addition to mudflows in Aspen and the requirements in the Mudflow Chapter and Floodplain Chapter should be addressed together.

6.6 Definitions

BFE – Base Flood Elevation is the 100-year flood elevation or the water surface elevation resulting from a flood that has a one percent chance of equaling or exceeding that level in any given year (100-year flood).

Detention – Management practice designed to protect against flooding by storing water for a limited period of time. Online detention refers to storage that uses a structural control facility to intercept flow directly within a conveyance system or stream. Offline detention refers to a separate storage facility in which flow is diverted from the conveyance system.

Encroachment – Land development impingement into a floodplain, where the magnitude of flood peak discharge will be increased due to removal of floodplain storage.

FIRM – Flood Insurance Rate Map – The official map on which the Federal Emergency Management Agency has delineated both the areas of special flood hazards and the risk premium zones.

FIS – Flood Insurance Study – The official report provided by the Federal Emergency Management Agency that includes flood profiles, the Flood Boundary-Floodway Map, and the water surface elevation of the base flood (BFE).

Floodway – The channel, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 100-year discharge can be conveyed with no rise in the water surface above the BFE.

Floodplains – Any land area susceptible to being inundated by flood waters from any source.

Free Board – An additional amount of height above the Base Flood Elevation used as a factor of safety in determining the level at which a structure's lowest flood must be elevated or flood-proofed to be in accordance with State or Aspen floodplain management regulations.

Lowest Floor – The lowest enclosed area (including basement, finished or unfinished). An \enclosure, usable solely for parking of vehicles, building access or storage; , is not considered a building's lowest floor, provided that such enclosure is not built so as to render the structure in violation of the applicable non-elevation design requirements of the City Code.

NFIP – National Flood Insurance Program – A federal program established by Congress to identify flood prone areas nationwide and make flood insurance available to the owners and leasers of property in the communities that participate in the program. In order to participate in this program, local communities must agree to implement and enforce measures that reduce future flood risks in special flood hazard areas.

Retention – Management practice used to prevent flooding and downstream erosion by storing water for long periods of time.

6.7 References

Colorado Floodplain and Stormwater Criteria Manual, Volume 1, January 2006

FEMA, 2008 - Federal Emergency Management Agency, Flood Insurance Study Guidelines and Specifications for Study Contractors, February 2008.

FEMA - Federal Emergency Management Agency, Appeals, Revisions and Amendments to Flood Insurance Maps, A guidebook for Local Officials (FIA-12)

FEMA, 2008 - Federal Emergency Management Agency, NFIP Regulations, Title 44, Chapter 1, Parts 60, 65, 70, and 72, revised November 2008.

FEMA, 1993 - Federal Emergency Management Agency, Wet Flood proofing requirements for Buildings Located in Special Flood Hazard Areas in Accordance
with the National Flood Insurance Program, Technical Bulletin 7-93, 1993.

National Flood Insurance Program (NFIP) Floodplain Management Requirements: A Study Guide and Desk Reference for Local Officials

Wet Flood proofing Requirements for Structures Located in Special Flood Hazard Areas in accordance with the National Flood Insurance Program. http://www.fema.gov/pdf/fima/job14.pdf

UDFCD, 2008- Urban Drainage and Flood Control District, Urban Drainage Storm Water Management Model (UDSWM), Users Manual, August 2008,