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Section 400 Planning

401 INTRODUCTION

Storm drainage is a part of our overall environment, regardless of whether it is an urban or rural environment. The need for and function of stormwater facilities are often overlooked or dismissed by the public until a large storm event brings them to the forefront of the public awareness. While rural areas typically require less direct management of stormwater runoff than urban areas, small mountain streams in very rural areas can become raging rivers after a large storm or storm and snowmelt event.

Planning for stormwater management will be woven into overall development planning for both public and private facilities, and addressed early in the process. Failure to plan for stormwater management facilities at the earliest stages of development planning can lead to problems finding the space required to accommodate stormwater runoff; problems meeting regulatory requirements; facilities that are difficult to maintain; and, ultimately, a potentially higher infrastructure cost. When stormwater facilities are planned in advance as an integral part of development as a whole, they can be thoughtfully designed as public amenities to include functionality in addition to conveying water from one place to another. Stormwater facilities that are thoughtfully planned, especially open channels, can provide recreational opportunities, wildlife habitat, and visual interest. These facilities can also benefit downstream properties and drainageways through improved water quality and a more balanced sediment load.

Storm drainage is a regional phenomenon that affects all governmental jurisdictions and all parcels of property. What happens in one part of a watershed, or even an entire region, will have an effect in other parts of that watershed or region. This cause and effect drives the need to balance both public and private involvement and requirements. It is not effective to plan stormwater facilities for a single site without knowing the impacts to the larger system. Coordination and planning shall occur on a regional level.

The UDFCD has collaborated with communities within the UDFCD boundary, including Boulder County, to develop stormwater master plans for most of the watersheds within the UDFCD boundary. The UDFCD boundary and stormwater master plans that have been completed by the UDFCD can be found on their interactive website (<http://udfcd.gisworkshop.com/>) or via an internet search for “UDFCD mapping.” Master planning efforts are requested by local governments and scheduled as part of a 4-year strategic plan. These plans identify locations with diminished water quality, determine appropriate flood risk management projects, identify the need for right-of-way acquisition, and provide justification for expenditure of funds for public improvements to storm drainage facilities that will enhance the general health and welfare of the region.

This section of the MANUAL focuses on several of the many facets of storm drainage design to consider before and during development and does not discuss specific planning submittal requirements for development review. Section 200 Submittals provides discussion on that topic. This section also does not discuss any of the many permits that are required late in the planning stages, including county,

state, and federal permits. These permits are discussed at length in Section 1400 Environmental and Regulatory Permitting.

402 PLANNING PROCESS

Because the impacts of stormwater can be far reaching geographically, drainage planning is a complex process. Several things will be considered during planning, but the general planning process is as follows:

1. **Major Drainage Planning.** This is the highest level of stormwater planning. Local and regional planning efforts will consider the major drainage system necessary to manage the 100-year runoff. Implementation of major drainage plans can reduce loss of life and major damage to the community and its infrastructure.
2. **Outfall System Planning.** Outfall system planning is watershed-based and identifies detention, water quality, and conveyance practices within a watershed. Outfall system plans typically address storm drain improvements, stream crossing improvements, increased conveyance, channel stabilization, and floodplain preservation.
3. **Initial Drainage System Planning.** This level of planning considers the drainage system required to transport runoff from the 2-year to 5-year storm events. Initial system planning will have the goal of minimizing drainage problems from these more frequently occurring storms.
4. **Water Quality and Environmental Design.** Stormwater planning efforts will address stormwater quality treatment, opportunities to mimic natural hydrology and preserve natural features, wildlife habitat, and the impacts of new facilities. A multi-disciplinary design team can help to ensure that all potential benefits are considered in the drainage planning effort.

403 PLANNING FOR STORMWATER MANAGEMENT

This section provides brief discussions regarding the general impacts of development and several factors that will be considered when planning stormwater management facilities.

403.1. Impacts of Potential Development

Development results in increased imperviousness and increased runoff rates and volumes. These increases can have significant impacts to downstream properties, existing natural channels, and infrastructure. Downstream properties can be flooded if increased runoff rates cannot be handled by existing stormwater facilities. Natural channels can experience extreme erosion due to the increased flow rates if corrective measures are not taken as development increases. Roads can be washed out if culverts and bridges are not upsized to accommodate the increases. Water quality often suffers with development as well. Sediment, nutrients, heavy metals, and trash and debris can all be associated with development. At a minimum, new infrastructure will be designed to accommodate future flow rates, as opposed to existing ones. Future flow rates are those that are anticipated to exist once full build-out of an area in accordance with proposed land use is complete.

403.2. Master Planning

Several master plans have been completed in Boulder County to define proposed drainageway improvements needed to address existing drainage problems or impacts of development. Future master plans and updates to existing master plans may be completed in the future. To ensure proposed development and new improvements to the overall storm drainage system will be compatible with plans for the surrounding areas, the county requires all improvements to be designed in accordance with adopted master plans and the criteria herein.

403.3. Maintenance Considerations

The function and effectiveness of many storm drainage and water quality facilities depends on adequate maintenance. Planning for maintenance activities must be included in the design of all stormwater management facilities, including providing space for personnel and equipment to access the facility from the nearest public road and limiting the need for maintenance by reducing the potential for sediment and debris to accumulate to the extent possible.

403.4. Multiple Uses and Space Allocation

Because stormwater management is part of the larger environment, space must be set aside to accommodate it. It may appear initially that providing space for stormwater management facilities such as channels and storage and water quality facilities is in direct competition with other land uses. However, not providing adequate space for stormwater facilities will ultimately disrupt the function of other land uses, especially during large storm events. Additionally, stormwater facilities can also be treated as a resource that provides recreational and social opportunities, wildlife habitat, visual interest, and water quality benefits. Facilities intended for use only during very large storm events, such as large or off-line storage facilities, can also accommodate sports and parks facilities when they are not being used for detention. Infiltration and detention can be incorporated into landscaped areas. At a minimum, right-of-way and easements will be included during the planning stages of development to ensure sufficient space is allotted to stormwater management.

403.5. Channel Stabilization and Ecological Design

Channel erosion often occurs with changes in hydrology because of development. The creek master plans adopted by Boulder County, the UDFCD, and other jurisdictions within the county provide preliminary design information regarding which channels require stabilization and how best to provide it. Even if the recommendations for stabilization do not currently involve ecological design concepts, these will be considered for all channel stabilization projects in the county to provide additional benefits, such as wildlife habitat and improvements to water quality. Ecological design concepts are discussed in Section 700 Open Channels. All improvements proposed must address the recommendations contained within the master plans adopted by the county. Work in channels will also consider impacts to regulatory floodplains and wetlands as part of the planning process.

403.6. Low Impact Development

The concept of Minimizing Directly Connected Impervious Areas (MDCIA) can contribute significantly to reducing runoff volume and peak flow rate and enhancing water quality. The concept is that the effective imperviousness of a site can be reduced by designing pervious areas, such as driveways, parking lots, and roofs, to discharge to pervious areas (such as grass buffers and swales) before discharging from a site. Impervious areas such as parking lots can also be broken into smaller individual

areas with pervious areas interspersed. This type of layout will slow the rate of runoff from a site and allow more opportunity for runoff from the impervious areas to infiltrate into the pervious areas. While using this strategy at a single site might not have a large effect on the watershed as a whole, low-impact development practices implemented routinely throughout a watershed can have a very large effect, especially on water quality. Additional information on low-impact development can be found in the USDCM.

403.7. Detention Ponds and Permanent Water Quality Facilities

Detention and permanent water quality facilities shall be sized and sited very early in the development planning process to ensure that side slopes can remain relatively flat. This will allow the facilities to be more easily maintained and to be incorporated into an overall site use plan that will allow them to be viewed as site amenities, rather than a necessary nuisance. The potential for infiltration will be evaluated. Local storm drains shall be incorporated into the functionality of the facility, and the design depth of the water in the detention or water quality facility will consider adjacent property use.

404 UNIQUE SITE CONSIDERATIONS

The considerations in this section occur much less frequently, but county staff and developers will determine if each of these items is applicable to the site being evaluated, as the impacts from these items can be extensive.

404.1 Water Rights and Raw Water Ditches

Drainage improvements must not affect water rights or the function of raw water ditches. The presence and potential impact of and to local head gates, raw water ditches, and reservoirs needs to be evaluated early in the planning process to determine appropriate measures required to avoid injuring water rights. Raw water ditch and reservoir owners must be contacted to determine what options are acceptable or impermissible prior to beginning design. Raw water ditches are not typically intended to convey stormwater runoff as transbasin diversions may occur; although, there are exceptions. Consent from the ditch owner(s) is required with the development application if the proposed improvements will alter flow patterns, quality, rates, or quantities to or within an existing raw water ditch.

404.2 Jurisdictional Dams and Reservoirs

There are over 100 jurisdictional dams in Boulder County, as defined by the Colorado Division of Water Resources Dam Safety Branch. Most are owned and operated by private irrigation companies, water districts, or municipalities, while a few are owned and operated by Boulder County Parks and Open Space. The CODE states that, "Land which is subject to a possible upstream dam failure shall not be platted unless the potential flooding condition is alleviated according to plans approved by the County Engineer, unless otherwise approved by the State Engineer." Development shall not be planned on lands that are subject to inundation by a dam breach without a design exception.

404.3 Groundwater

Groundwater can affect the function of stormwater management facilities, sump pumps, and other infrastructure. Prior to development, each site must be evaluated to determine potential impacts of groundwater. All designs shall accommodate or mitigate those impacts.

Groundwater may also increase with development and urbanization, often due to increased irrigation. Foundation drains and sump pumps are often used to collect and discharge these flows to the surface, often at locations that are not ideal. Icing or algae growth may result, which will affect the quality of life of local residents. During the planning stages of development, developers shall provide the county a discussion of potential groundwater impacts, such as impacts to wells, raw water ditches, and reservoirs, recommendations for solutions to mitigate those impacts, and a list of potentially impacted interests. The county's policy on groundwater discharge from sump pumps can be found in Section 308.

Any activities that result in the discharge, use, or handling of groundwater that are not addressed in this MANUAL shall be conducted in accordance with the State of Colorado's groundwater regulations. The state's regulations concerning groundwater are held at the following offices:

Colorado Department of Public Health and Environment, Water Quality Control Division – Domestic Ground Water Discharge Permit Program

Colorado Department of Natural Resources, Division of Water Resources – Ground Water Administration and Well Permitting

State of Colorado Ground Water Commission – Rules and Regulations for the Management and Control of Designated Ground Water

Colorado Department of Public Health and Environment, Water Quality Control Commission, Regulation No. 61 – Colorado Discharge Permit System Regulations (Section 61.14 Groundwater)

Colorado Department of Public Health and Environment, Water Quality Control Commission, Regulation No. 41 – The Basic Standards for Ground Water

