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SECTION 1.0 GENERAL

1.1 **PURPOSE**

The purpose of the "City of Greeley Storm Drainage Design Criteria" (hereafter referred to as "Criteria") is to present the minimum design and technical criteria for the analysis and design of storm drainage facilities. These facilities shall be designed to reduce flooding, improve water quality released into the river system and aid in the compliance of the National Pollutant Discharge Elimination System (NPDES) and the City's Colorado Discharge Permit System (CDPS) permit. These Criteria may be amended as new technology is developed or a need for revision is demonstrated and proven through experience and use.

All subdivisions, residential, commercial, industrial development or any other proposed construction submitted for approval under the City of Greeley regulations shall include adequate storm drainage system analysis and drainage system design. Such analysis and design shall conform to these criteria set forth herein. Options or alternatives to the provisions of these Criteria may be suggested by the applicant, and used only on the written approval of the City. The applicant must demonstrate through adequate information and technical documentation that such options are equal to or better than the requirements of these Criteria.

Policies and technical criteria not specifically addressed in this document shall follow the provisions of the most recent edition and revisions of the Urban Drainage and Flood Control District (hereafter called "Urban Drainage") "Urban Storm Drainage Criteria Manual" (hereafter abbreviated to USDCM), which is incorporated in these Criteria by reference. Copies of the USDCM can be obtained from the Urban Drainage, 2480 West 26th Avenue, Suite 156B, Denver, Colorado 80211-5500.

The applicant is also referred to the Colorado Department of Transportation's Standard Plans ("M-Standards") for additional design details not covered in these Criteria or the USDCM.

These Criteria shall apply to all land within the incorporated area of the City of Greeley, and those areas outside the City of Greeley covered by intergovernmental agreements with the appropriate jurisdiction, including any public lands. These Criteria shall apply to all facilities constructed on City Right-of-Way; easements dedicated for public use, private roads, and to all privately and quasi-publicly owned and maintained stormwater detention facilities.

1.2 **PRINCIPLES FOR STORM DRAINAGE PLANNING & DESIGN**

Planning and design of all stormwater drainage systems should adhere to the City of Greeley ordinance No. 5, 1995, which established and enacted Article 14.15 of the Greeley City Code. Article 14.15 of the City Code establishes a comprehensive stormwater management program.

The provision for adequate drainage in urban areas is necessary to preserve and promote the general health, welfare, and economic well-being of the region. The City of Greeley recognizes drainage as a sub-system of all development; and as such, the planning and design of drainage facilities shall be included in the development process.

Planning and design of stormwater drainage systems should not be based on the premise that problems can be transferred from one location to another. Colorado drainage law recognizes the inequity of transferring the burden of managing storm drainage from

one location or property to another. Liability questions also arise when historic drainage patterns are altered. The diversion of stormwater drainage from one basin to another should be avoided unless specific and prudent reasons justify and dictate such a transfer.

The subdivision process can significantly alter the historic or natural drainage paths. When these alterations result in a subdivision outfall system that discharges back into the natural drainage way at or near the historic location, then the alterations (inter-basin transfer) are generally acceptable. However, when the subdivision outfall system does not return to the historic drainage way, then inter-basin transfer may result. This inter-basin transfer should be prevented since it violates a basic drainage law principle by discharging water into a subservient property in a manner or quantity to do more harm than formerly. If the development significantly increases the drainage area tributary to the subdivision outfall, then inter-basin transfer into the property has occurred and must be prevented.

In addition to planning for the control of stormwater runoff flows, consideration for maintaining the quality of the urban stormwater runoff resource should be included in the evaluation and design of drainage facilities. Drainage facilities can fulfill other purposes in conjunction with primary stormwater considerations. Recreational, water quality and open space values should be integrated where possible.

Likewise, facilities not designed primarily for drainage, such as parks, open space areas and other natural resource areas, can frequently be designed to utilize or enhance some aspects of the stormwater runoff resource or provide some drainage control benefits.

The City requires on-site detention for all new development, expansion, and redevelopment. A variance may be granted for new development, expansion and redevelopment in the existing downtown "Redevelopment District" (See Section 11.0 - Detention).

Developments are responsible for runoff to the centerlines of all adjacent streets surrounding their site. This runoff must be routed to on-site detention facilities and released at a 5-year historic rate as required for other on-site runoff.

On-site detention requirements may be waived where regional detention facilities are sized with the capacity to accommodate flows from a fully developed basin and are publicly owned and maintained. In this situation however, as in all new development, a stormwater management plan (SWMP) must be developed and implemented (see Section 12.0 Stormwater Quality Enhancement). Therefore, the SWMP may dictate the need for an on-site detention facility for the purposes of providing water quality capture volume (see USDCM for more detail).

On-site detention facilities are not required for attenuation of off-site flows. However, the urbanization process must safely pass all off-site flows (including all irrigation and stormwater flows) through the development without creating any adverse impact to other upstream or downstream properties.

Detention facilities shall not be constructed within public rights-of-way. The design high water level of detention ponds shall not encroach upon public rights-of-way.

Adequate drainage easements must be provided for all detention and stormwater conveyance facilities including proper access for operation and maintenance (see various applicable sections of this criteria manual for more details).

The City requires that maintenance access be provided to all storm drainage facilities to assure continuous operational capability of the system. The property owner shall be re-

sponsible for the maintenance of all privately owned drainage facilities including inlets, pipes, culverts, channels, ditches, hydraulic structures, and detention basins located on their land unless modified by the Development Agreement. Should the property owner fail to adequately maintain said facilities, the City shall have the right to enter said land for the purposes of operations and maintenance. All such maintenance costs shall be assessed to the property owner.

Drainage easements shall be shown on the preliminary and final plats and any development plans. The plans shall state that the City has the right of access on the easements, which shall be kept clear of flow obstructions and/or obstructions to maintenance access.

On-site erosion/sedimentation control programs are required for all development and redevelopment (see Section 13.0 Construction Site Erosion and Sediment Control).

The urbanization process may adversely affect downstream properties due to changes in the historic frequency and quantity of stormwater discharge. Even though on-site detention facilities are provided which reduce the historic peak runoff from development, the increase in impervious area will result in a more frequent release of stormwater. With the installation of perimeter drains around buildings, the historic release of surface water to downstream properties may be increased due to the diversion of groundwater. This may also affect existing water rights because of the diversion of groundwater to a surface flow.

In all cases, the Developer is responsible for mitigation of any and all impacts to other property or water rights owners. The Developer must negotiate and obtain drainage easements as needed from all downstream properties to accept the changes in the historic frequency and quantity of stormwater discharge. The Developer must augment as necessary any and all losses of water rights.

Due to the natural terrain on which urbanization occurs, some lots within subdivisions are located at higher elevations than others. It is common law in Colorado that properties at lower elevations must accept runoff from higher elevations. Lots within subdivision type developments can be designated as either Type "A" lots (those at lower elevations) or Type "B" lots (those at higher elevations). A more thorough description of these two types of lots is as follows:

"A" lots shall provide surface drainage for on-site and pass-through runoff from the back of the lot to the frontage top of walk elevation. Pass-through runoff, if present, will originate from any adjacent type "B" lot. Type "A" lots typically do not drain onto other type "A" lots. Type "A" lots pass their drainage onto street right-of-way and shall have a minimum slope of two percent (2%) from the rear of the lot to the street.

"B" lots, if feasible, shall provide surface drainage for the front one-half or more of the lot and house to the frontage top of walk elevation. A type "B" lot may discharge surface runoff to an adjacent type "A" lot. A Type "B" lot shall have a minimum slope of two percent (2%) from the high point of the lot to the street and rear of the lot.

Site grading plans shall designate lot corner elevations and a mid point elevation on all side lot lines for lot grading. These plans shall also include the top of foundation elevations for houses or structures. An as-constructed Site Certification Survey is required for each lot for assurance that drainage will actually function as per the approved design grading plans.

For a Type "A" lot, a drainage way shall be required to allow surface runoff to drain from the low point of the backyard to the frontage top of walk elevation. This drain way may consist of a "V" type ditch or swale or drainage along a retaining wall. A typical swale may be from six (6) inches to over twelve (12) inches in depth in order to provide a continuous slope from the backyard to the street top of walk. In most cases, there is between twelve (12) inches and eighteen (18) inches of fall from the low point of the backyard to the frontage top of walk for a Type "A" lot.

For the purposes of flood protection, window wells on all houses shall be extended at least six (6) inches above the ground level or to the top of foundation elevation. An eight (8) inch to twelve (12) inch deep space shall be provided inside the window well below the bottom of the window elevation. This space will store some water should it get into the window well before it reaches the bottom of the window. Window wells shall be sealed all around with outdoor type silicon caulking.

Drainage easements are sometimes provided within subdivisions along back property lines intended to drain runoff to street right-of-way. These easements, however, are often ineffective due to improper grading of lots or restrictions created by wood privacy fences or other types of obstructions. As a result, these easements shall not be relied upon for drainage of backyard areas.

It shall be a subdivision designer's primary goal to design Type "A" lots back to back with other Type "A" lots. The secondary objective shall be to design Type "A" lots back to back with Type "B" lots. Only as a last alternative will Type "B" lots be allowed to back up to other Type "B" lots. This will help minimize the problem of accumulative drainage being diverted down rear lot lines and causing flooding problems at the end of the drainage. If Type "B" lots do back up to other Type "B" lots, a two (2) foot wide by three (3) inch deep concrete trickle pan shall be installed offset, on one side or the other from the property line.

Drainage easements through the back or sides of lots within subdivisions shall not be designated to convey off-site flows through the development. Right-of-ways dedicated to the City must be provided when necessary to convey these off-site flows. Plats shall show a five (5) foot drainage easement either side of a side lot property line between structures.

Sometimes drainage easements for on-site surface water flows must be designated within subdivision lots when no other viable alternatives exist. When drainage easements of this type are necessary, Developers, Home Builders/Owner's must accept the responsibility to provide site grading in a manner consistent with development plans regarding site drainage. Drainage easements shall not be restricted. On-site and pass-through runoff shall be routed to streets, along property lines, and through easements in a manner, which controls surface runoff. To accommodate runoff, "V" shaped swales may need to be constructed at least one (1) foot deep and six (6) feet wide.

It is usually better to line swales with a woven weed barrier fabric geo-textile and crushed rock as opposed to a grass swale. Grass swales sometimes fill in and become non-existent over time.

Drainage easements and drainage swales should not be blocked with wood privacy fences. A space shall be left under the fence for water to pass. Steel rebar may be pounded into the ground at three (3) inch to four (4) inch spacing to keep dogs and small children from crawling under the fence.

1.3 COMPREHENSIVE DRAINAGE PLAN

The planning of drainage facilities must be included in the urbanization process. The first step is to include drainage planning with all regional and local development master plans. These plans shall address multiple purpose use of land for drainage and open space.

Stormwater management facilities, such as channels, detention ponds, and storm drains, serve both a conveyance and storage function. When the space requirements associated with these facilities are considered, the provision for adequate drainage becomes a competing use for space along with other land uses. If adequate provision is not made in a land use plan for the drainage requirements, stormwater runoff shall conflict with other land uses and shall result in water damages, and shall impair or even disrupt the functioning of other urban systems.

The City has participated in the development of regional basin-wide master plans to define the major drainage way facilities. These plans set forth requirements for new development and identify the required capital improvements. These master plans also provide criteria and requirements associated with unit runoff rates, levels of affordable flood protection, etc. Where these criteria set forth in this manual conflict with the information in the master plan, the information in the master plan will govern. In addition, the City requires that all new development and redevelopment shall participate in the design and construction of the major drainage way system within the development as defined by adopted master drainage plans or as required by the City.

1.4 IRRIGATION FACILITIES

There are many irrigation ditches and reservoirs in the City. The ditches and reservoirs have historically intercepted the storm runoff from the rural and agricultural type basins, generally without major problems. However, with urbanization of the basins, the storm runoff has increased in rate, quantity and frequency, and even the water quality has changed.

In evaluating the interaction of irrigation ditches with a major drainage way for the purpose of basin delineation, the ditch should not be used as a basin boundary. Irrigation ditches are designed with flat slopes and limited carrying capacity decreasing in the downstream direction. As a general rule, irrigation ditches cannot be used as an outfall point for the storm drainage system because of these physical limitations. In addition, certain ditches are abandoned after urbanization and, therefore, could not be considered a permanent part of the storm drainage system. Due to these changes in the urban stormwater response, irrigation facilities shall not be considered as part of the available drainage system for new development.

Irrigation facilities must be preserved through new development areas in order to maintain service to any upstream or downstream users of the irrigation ditch. Adequate easements must be provided for the ditch including access for operations and maintenance. Irrigation lines passing under roadways must be approved RCP pipe materials.

1.5 RELATIONSHIP TO OTHER STANDARDS

Whenever a provision of these Criteria, and any other provision in any law, ordinance, resolution, rule, or regulation of any kind, contains any restrictions covering any of the same subject matter, the most restrictive standard shall apply.

These Criteria are consistent with the Urban Drainage and Flood Control District's criteria. If the state or federal government imposes stricter criteria, standards, or require-

ments, these shall be incorporated into the City's requirements after the appropriate due process needed to modify the City's regulations and standards.

Adherence to these Criteria does not remove the applicant's responsibility to investigate and obtain any other regulatory permits or approvals, from local, regional, state or federal agencies, that may be required for a particular project.

1.6 VARIANCES

It is the responsibility of the Owner, or Owner's selected Design Engineer, to request any variances from City Standards during the early stages of planning or design development. Variances from these Criteria shall be considered on a case-by-case basis.

1.7 REVIEW AND ACCEPTANCE

The City shall review all drainage submittals for general compliance with these specific Criteria. An acceptance by the City does not relieve the Owner, Engineer, or Designer from the responsibility of ensuring that the calculations, plans, specifications, construction, and as-built drawings comply with these Criteria.

Approval of the submittal information shall remain valid for one year after the acceptance date. If construction of the project has not been initiated within that period, the acceptance by the City shall become invalid.