

**CHERRY CREEK BASIN WATER QUALITY AUTHORITY
CHERRY CREEK RESERVOIR WATERSHED**

***Control Regulation 5 CCR 1002-72
Stormwater Permit Requirements Guidance Document***

September 4, 2019

FINAL DRAFT

TABLE OF CONTENTS

Table of Contents	i
Acronyms	iii
Acknowledgements	iv
CHAPTER 1 - INTRODUCTION.....	1
A. BACKGROUND.....	1
B. CHERRY CREEK BASIN WATER QUALITY AUTHORITY.....	1
C. PURPOSE AND SCOPE.....	2
D. GENERAL REQUIREMENTS.....	4
E. APPLICABILITY.....	5
F. DEFINITIONS.....	7
G. CONFLICT WITH OTHER REQUIREMENTS.....	15
H. ADDITIONAL EXCLUSION.....	15
CHAPTER II - CONSTRUCTION BMP REQUIREMENTS	17
A. REGULATED ACTIVITIES	17
B. DESIGN CRITERIA AND STANDARDS	17
C. REQUIRED CONSTRUCTION BMPS.....	17
D. INDIVIDUAL HOME CONSTRUCTION	17
E. INSPECTION/OPERATION AND MAINTENANCE.....	18
F. EXCLUSIONS.....	18
CHAPTER III - POST-CONSTRUCTION BMP REQUIREMENTS	20
A. REGULATED ACTIVITIES	20
B. DESIGN CRITERIA AND STANDARDS	21
C. CHANNEL OR STREAM RECLAMATION	25
D. OPERATION AND MAINTENANCE.....	27
E. PROTECTION OF ALLUVIAL DRINKING-WATER SUPPLIES.....	28
F. HIGHWAY AND ROADWAY RECONSTRUCTION.....	29
G. EXCLUSIONS.....	29
CHAPTER IV - INDUSTRIAL AND COMMERCIAL ACTIVITY.....	32
A. REGULATED ACTIVITIES	32
B. ADDITIONAL REQUIREMENTS.....	33
C. DESIGN CRITERIA AND STANDARDS	34
E. EXCLUSIONS.....	36
CHAPTER V - AGRICULTURAL BMP REQUIREMENTS	37
A. POST-CONSTRUCTION BMP REQUIREMENTS.....	37
CHAPTER VI - STREAM PRESERVATION AREAS.....	38
A. REGULATED ACTIVITIES	38
B. DESIGN CRITERIA AND STANDARDS	38
C. EXCLUSIONS.....	40
CHAPTER VII – RURAL ROAD CONSTRUCTION AND MAINTENANCE	41
A. REGULATED ACTIVITIES	41
B. REQUIRED BMPs.....	42
C. EXCLUSIONS.....	42
CHAPTER VIII – HIGHWAY AND ROADWAY RECONSTRUCTION (RESERVED)	44

CHAPTER IX – LARGE LOT SINGLE FAMILY DEVELOPMENT.....	45
A. REGULATED ACTIVITIES	46
B. REQUIRED POST CONSTRUCTION BMPs.....	46
C. EXCLUSIONS.....	47
CHAPTER X – TRAIL CONSTRUCTION.....	48
A. REGULATED ACTIVITIES	48
B. REQUIRED POST CONSTRUCTION BMPs.....	49
C. EXCLUSIONS.....	49

APPENDICES

- A. WQCV HYDROLOGIC ANALYSIS**
- B. SEMSWA WATER QUALITY TREATMENT MATRIX**

List of Tables

Table 1. Website Links for Stormwater Quality Criteria

ACRONYMS

ADT	Average Daily Traffic
BMPs	Best Management Practices
CDPHE	Colorado Department of Public Health and the Environment
CDPS	Colorado Discharge Permit System
CFR	Code of Federal Regulations
CRS	Colorado Revised Statutes
CR-61	Colorado Discharge Permit System Regulation No.61
CR-72.7	Cherry Creek Reservoir Control Regulation 5 CCR 1002-72, specifically section 72.7,
CWA	Clean Water Act
Division	Water Quality Control Division
EPA	U.S. Environmental Protection Agency
EURV	Excess Urban Runoff Volume
FSD	Full Spectrum Detention
MEP	Maximum Extent Practicable
MS4	Municipal Separate Storm Sewer System
NRCS	Natural Resource Conservation Service
PRF	Pollutant Reduction Facility
ROW	Right of Way
SEMSWA	Southeast Metropolitan Stormwater Authority.
SPCC	Spill Prevention Control and Countermeasure Plan
TMAL	Total Maximum Annual Load
UDFCD	Urban Drainage and Flood Control District
USDCM	Urban Storm Drainage Criteria Manual, Volumes 1, 2 and 3
WQCV	Water Quality Capture Volume

CHAPTER 1 - INTRODUCTION

A. BACKGROUND

The Federal Clean Water Act (CWA) requires that stormwater discharges from certain types of facilities be authorized under stormwater discharge permits (See 40 Code of Federal Regulations [CFR] 122.26). The goal of the stormwater permits program is to reduce pollutants entering streams, lakes, and rivers in runoff from residential, commercial and industrial areas. The original 1990 regulation (Phase I) covered municipal (i.e., publicly-owned) storm sewer systems for municipalities over 100,000 population. The regulation was expanded in 1999 to include smaller municipalities as well and is referred to as Phase II.

In Colorado, stormwater discharge permits are issued by the Colorado Department of Public Health and Environment, Water Quality Control Division (the “Division”). Such permits are part of the Colorado Discharge Permit System, or CDPS, under Control Regulation 5 CCR 1002-61 (CR 61). Phase II municipal separate storm sewer systems (MS4s) are covered under a general permit for stormwater discharges from MS4s. The main requirement of the general permit is for the MS4 operator to develop and implement stormwater management programs, or minimum measures in accordance with the requirements of their permit.

Stormwater discharges from Phase I and II MS4s within the Cherry Creek Reservoir Watershed are further regulated under Cherry Creek Reservoir Control Regulation 5 CCR 1002-72¹, , section 72.7 (CR-72.7, or Control Regulation 72.7), Stormwater Permit Requirements. CR-72.7 sets forth, among other requirements, additional measures for MS4s within the Cherry Creek Reservoir watershed to protect the water quality of Cherry Creek Reservoir and Cherry Creek.

B. CHERRY CREEK BASIN WATER QUALITY AUTHORITY

The Authority is a quasi-municipal corporation and political subdivision of the State that has primary responsibility for water quality in the Cherry Creek Reservoir Basin. The Authority is specifically empowered to develop and implement plans for water quality controls for the Reservoir, drainage basin and watershed (Authority's enabling legislation –Colorado Revised Statutes (C.R.S.) § 25-8.5-101, *et seq.*). The Authority’s specific BMP requirements are contained in the Cherry Creek Reservoir Control Regulation 5 CCR 1002-72 promulgated by the Colorado Water Quality Control Commission.

¹ All references to 5 CCR 1002-72 are to the version with an effective date of November 30, 2012.
(Footnote continued on next page)

C. PURPOSE AND SCOPE

The information and guidance presented in this document (Control Regulation 72.7 Guidance Document²) will assist governing land use agencies, located within the Cherry Creek basin, and developers in meeting the Authority's requirements outlined in Control Regulation 72.7.

1. **Authority's BMP Requirements.** Additional and/or more stringent best management practices (BMPs) to control the quality of stormwater runoff in the Cherry Creek Reservoir Basin from private and public property are necessary to reduce pollutant concentrations and loads of, including nutrients and sediment, reaching Cherry Creek and Cherry Creek Reservoir in furtherance of health, safety, and general welfare in the Cherry Creek Watershed. Therefore, this CR-72.7 Guidance Document identifies additional and/or other special requirements for the following stormwater discharges:

- Construction BMP Requirements (see Chapter II).
- Post-Construction BMP Requirements (see Chapter III).
- Industrial and Commercial Activities (see Chapter IV). This includes industrial and commercial activities not regulated elsewhere that could result in a discharge of pollution such as, but not limited to, facilities subject to Chapter III post-construction requirements; facilities subject to effluent limitation guidelines, new source performance standards, or toxic pollutant effluent standards; facilities with certain Standard Industrial Classifications under SIC codes 24 (Lumber & Wood Products), 28 (Printing, Publishing, and Allied Industries), 32 (Leather and Leather Products), 33 (Primary Metals Industries), and 10 through 14 (Mineral Industry) and other SIC codes; hazardous waste treatment, storage or disposal facilities; landfills, land application sites, and open dumps that receive(d) industrial waste; recycling facilities; steam electric power-generating facilities; transportation facilities with vehicle maintenance shops, equipment cleaning operations, or airport deicing operations; domestic wastewater or biosolids treatment facilities (not including sites where biosolids are beneficially reused); and construction activity, including clearing, grading and excavation, that results in the disturbance of five or more acres or land that is part of a larger common plan of development that will ultimately disturb five acres or more; e.g., gas stations and fueling areas, equipment storage, cleaning, and maintenance areas.
- Land disturbances within Stream Preservation Areas (see Chapter VI).
- Rural Road Construction and Maintenance (see Chapter VII).
- Highway and Roadway Reconstruction (see Chapter VIII Reserved).

² This CR-72.7 Guidance Document updates and replaces in its entirety the Authority's 2000 Stormwater Requirements (Cherry Creek Basin Water Quality Authority, February 16, 2000. *Cherry Creek Reservoir Watershed Stormwater Quality Requirements*) and the previous April 27, 2011 version of the CR-72.2 Guidance Document.

- Large Lot Single Family Development (see Chapter IX).
- Trail Construction (see Chapter X).

2 **Tiered Approach to Stormwater Management.** The January 1, 2010 revision to Control Regulation 72 included a major substantive revision that implemented a three-tiered approach to stormwater treatment in the Cherry Creek Watershed. The Commission noted in its Basis and Purpose:

For post-construction development and redevelopment, the Commission adopts a three-tiered approach to stormwater management BMPs to coincide with the requirements found in Regulation #61 (5 CCR 1002-61), while specifically addressing concerns within the Basin.

The three-tiered approach recognizes that development and redevelopment impacts on stormwater quality are also dependent on changes in impervious area and not just land disturbance area. This approach provides the flexibility to allow minor increases in impervious areas without overburdening the property owner and the land use agency, but still requiring more stringent BMPs when the development or redevelopment is considered significant. The definition of the tiered approach found in CR-72 is summarized in the following table:

Land Disturbance (acres) vs. Impervious Area (sq. ft.)

Land Disturbance area	New or Increased Impervious Area (sf)		
	0-500	501-5000	5001 +
< 1 acre	Tier 1	Tier 2	Tier 3
1 acre +	Tier 3	Tier 3	Tier 3

3 **Agricultural Activities.** Agricultural land uses are recognized as land disturbances and a potential source of pollutant loading. The Division has recommended BMPs for Agriculture and Silviculture as part of the Colorado Nonpoint Source Management Program. Agricultural Activities, identified at Chapter I - Introduction, Section F - Definitions, are exempt from construction and post-construction BMP requirements in this CR-72.7 Guidance Document. However, certain activities are not excluded, including confined animal feedlot operations, commercial horse boarding stables and the construction of facilities or other activities generating stormwater runoff associated with industrial and/or commercial construction expansion and or redevelopment activity. Owners of all agricultural land disturbances are encouraged to implement applicable BMPs as identified in the Colorado Nonpoint Source Management Program, which recommends the installation of BMPs on a voluntary basis.

4 **Authority Review and Comment.** The requirements of this CR-72.7 Guidance Document will also govern the Authority's review of stormwater quality controls and BMPs within the Cherry Creek Reservoir Basin as a referral entity to land use agencies within the watershed. In the review of land disturbance applications from land use agencies, the Authority will also consider current standards, minimum requirements, and technical criteria adopted by each land use

agency. Table 1 provides a website link to each land use agency’s requirements for stormwater quality controls, which may include separate documents for construction (i.e.: grading and erosion control) and post-construction requirements:

Table 1 Website Links for Land Use Agency Stormwater Quality Criteria

Land Use Agency	Website Link
Arapahoe County	www.arapahoe.gov/553/Engineering-Services-Division
Douglas County	https://www.douglas.co.us/water/stormwater/
City of Aurora	https://www.auroragov.org/business_services/development_center/code_rules/design_standards/engineering_design_standards
City of Greenwood Village	http://www.greenwoodvillage.com/index.aspx?NID=558
City of Centennial	http://www.centennialco.gov/Community-Development/stormwater-semswa.aspx
City of Lone Tree	http://cityoflonetree.com/government/departments_and_divisions/public_works/development_review/engineering_criteria
Town of Parker	http://www.parkeronline.org/index.aspx?NID=210
Town of Castle Rock	http://www.townofcastlerock.org/2323/Plans
Colorado Department of Transportation	http://www.coloradodot.info/programs/environmental/water-quality/stormwater-programs.html
City of Castle Pines	No criteria adopted. Authority will consider each application on a case-by-case basis using the Douglas County criteria.
Town of Foxfield	No criteria adopted. Authority will consider each application on a case-by-case basis using the Arapahoe County criteria.
SEMSWA	http://semswa.org/semswa-stormwater-management-manual.aspx

5 **Exclusions.** Whereas the CR-72.7 Guidance Document applies to all land disturbances, regardless of the size of the disturbed area, some exclusions are allowed for specific construction and post-construction activities and for smaller disturbances, as measured by new or increased impervious area deemed to have minimal impact to water quality. Specific Automatic and Authorized exclusions permitted by 5 CCR 1002-72 are identified in the individual chapters. For Additional Authorized Exclusions, refer to Chapter I, Section H.

D. GENERAL REQUIREMENTS

This CR-72.7 Guidance Document contain standards for the implementation of construction (temporary) and post-construction (permanent) stormwater quality BMPs for land disturbances, and new development or redevelopment in the Cherry Creek Watershed, as defined at Chapter I – Introduction, Section F - Definitions. Property owners conducting a land disturbance, new development or redevelopment shall obtain approval from the land use agency

for site-specific plans that delineate construction and post-construction measures implemented at development sites to prevent the discharge of pollutants to the maximum extent practicable. The land use agency may request comments and recommendations from the Authority on the specific plans for construction and post-construction BMPs.

E. APPLICABILITY

1. **Regulated Activities.** This CR-72.7 Guidance Document applies to land disturbance activities in the Cherry Creek Watershed as defined by Colorado Statute 25-8.5-104 (Figure 1), including, but not limited to, the following land disturbances³:
 - a. Clearing, grading, or excavation of land;
 - b. Construction, including expansion or alteration, of a residential, commercial or industrial site or other new development or redevelopment defined at Chapter I - Introduction, Section F - Definitions;
 - c. Construction of public improvements and facilities such as roads, transportation corridors, airports, parks, and schools.
2. **Land Disturbance.** This CR-72.7 Guidance Document provides special standards and procedures for construction erosion control BMPs for all land disturbances, regardless of the size of disturbance.
3. **New Development and Redevelopment.** This CR-72.7 Guidance Document provides special standards and procedures for post construction BMPs for the following types of development activity that result in a land disturbance.
 - a. **Tiered Imperviousness Categories.** All new development and redevelopment are divided into three categories called Tier 1, Tier 2, and Tier 3, depending on increases in imperviousness. Tier 1 means a land disturbance less than one acre, and which increases imperviousness by less than 500-square feet is not required to provide post-construction BMPs, but is encouraged to do so. Tier 2 means a land disturbance less than one acre, and which increases imperviousness by more than 500- but less than 5,000 square feet must provide post construction BMPs, but are not required to include WQCV. Tier 3 means a land disturbance less than one acre and, which increases imperviousness by more than 5,000 square feet, must provide post construction BMPs that do include WQCV. Tier 3 also means any land disturbance greater than one acre and must provide post construction BMPs that do include WQCV.

³ Land disturbances are defined in Control Regulation 72 as “a man-made change in the natural cover or topography of the land, including grading, cutting and filling, building, paving, excavating and any other activities that may result in or contribute to soil erosion or sedimentation in waters or discharge of pollutants, as identified in section 72.7.2(b) of this regulation, except individual home construction, as defined in this section.”

- b. **Individual Homes.** Individual Home Constructions, as defined at Chapter I – Introduction, Section F - Definitions, are included within the scope of this CR-72.7 Guidance Document, but such activities are subject only to the specific requirements presented at Chapter II – Construction BMP Requirements, Section D – Individual Home Construction.
 - c. **Rural Road Construction and Maintenance.** Rural road construction, defined as roadways with an average daily traffic (ADT) count of 400 or less, are included within the scope of this CR-72.7 Guidance Document, but such activities are subject only to the specific requirements presented at Chapter VII - Rural Road Construction and Maintenance for construction and post construction BMPs.
 - d. **Highway or Roadway Reconstruction.** Reserved.
 - e. **Large Lot Single Family Development.** Large lot single family development, defined as a land disturbance , are included within the scope of this CR-72.7 Guidance Document, but such activities are subject only to the specific requirements presented at Chapter IX - Large Lot Single Family Development.
 - f. **Trail Construction.** Trail construction, defined as an access area for the purpose of operations, maintenance, or recreation that is constructed either with pervious surfaces (i.e., aggregate) or impervious surfaces (i.e., concrete, or asphalt) are included within the scope of this CR-72.7 Guidance Document, but such activities are subject only to the specific requirements of Chapter X - Trail Construction.
4. **Stream Preservation Areas.** This CR-72.7 Guidance Document provides special standards and procedures for land disturbances in Stream Preservation Areas, which include:
- a. Cherry Creek Reservoir,
 - b. All of Cherry Creek State Park,
 - c. Surface drainage and discharges to the Park within 100 feet of the Park Boundary;
 - d. Lands overlying the Cherry Creek 100-year floodplain, and
 - e. All lands within the 100-year floodplain of Cherry Creek tributaries, as defined by FEMA and the Urban Drainage and Flood Control District Flood Hazard Area Delineation studies.

F. DEFINITIONS

1. ***Agricultural Activities*** means agriculture and silvicultural activities generating nonpoint source discharges, including runoff from orchards, cultivated crops, pastures, range lands and forest lands; but not Concentrated Animal Feeding Operations (CAFOs).
2. ***Authority*** means the Cherry Creek Basin Water Quality Authority established pursuant to section 25-8.5-101, et seq., C.R.S.
3. ***Best Management Practices ("BMPs")*** means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of "state waters". BMPs also include treatment requirements, operating procedures and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage⁴.
4. ***Channel or Stream Stabilization*** means the activities used to minimize erosion and sedimentation within a surface, stormwater-runoff conveyance. Channel (or stream) stabilizations are designed based on hydrology of the tributary watershed that factors in storm runoff rate, volume, frequency, and duration from projected future-development conditions. Stabilization activities include, but are not limited to, excavation and grading; placement of fill; construction of check structures, drop structures, and channel bed and bank protection measures; and placement of vegetation that protects the channel and floodplain area of the conveyance. Channel and stream stabilization also recognizes that urban development in the watershed has significantly altered the hydrologic regime which affects requirements for design of stream stabilization projects.
5. ***Channel or Stream Reclamation*** is a sequence of physical modifications to maintain or establish an effective planimetric channel form, cross sectional shape, and longitudinal slope to improve stability, water quality, and ecological function. These actions include bed and bank stabilization (implementing grade control and bank protection), riparian buffers (maintaining a favorable mix of riparian vegetation), in-stream enhancement, and flood plain reconnection. Stream reclamation includes principles (UDFCD Criteria Volume 1, Chapter 8, Section 4) that account for changes in hydrologic regime from urban development and associated anthropogenic constraints found in the Cherry Creek watershed.⁵

⁴ Definition from 5 CCR 1002-61; from the version with an effective date of April 30, 2017.

⁵ Definition Interpreted from Final Report Stream Restoration as a BMP: Crediting Guidance, WERF1T13 (2016) and UDFCD Criteria Volume 1, Chapter 8, Sections 2-5 Naturalized Channels (January 2016).

6. **Check Structure** means a type of hydraulic structure used to flatten the grade of a channel to improve stability and designed based on an ultimate, longitudinal grade that is achieved primarily through continued erosion of the channel and includes one or more of the following characteristics:
 - a. Typically only consists of a vertical wall, often constructed from concrete or sheet metal.
 - b. Includes little or no grading to transition the area back to the natural channel
 - c. Does not include an energy dissipation structure at the downstream end of the check structure, as required by the Urban Storm Drainage Criteria Manual, Volume 1 and 2 for drop structures.
 - d. Typically designed for the minor flood (i.e., 2-year recurrence interval or more frequent).
7. **Cherry Creek Watershed** means all lands that drain into the following: (a) the mainstem of Cherry Creek, from the source of East and West Cherry Creek to the inlet of Cherry Creek Reservoir (Segment 1), including alluvial groundwater; (b) Cherry Creek Reservoir (Segment 2), including alluvial groundwater; (c) all tributaries to Cherry Creek, including wetlands and alluvial groundwater, from the sources of East and West Cherry Creeks (parts of Segment 4); and all lakes and reservoirs in the Cherry Creek Reservoir watershed (Segment 5, in part) as described in the Classifications and Numeric Standards - South Platte River Watershed, Regulation #38 (5 CCR 1002-38). The Cherry Creek Watershed is delineated in Figure 1 attached to this document.
8. **Construction BMPs** means temporary BMPs, either structural or non-structural, required for land disturbance activities at Chapter II – Construction BMP Requirements of the CR-72.7 Guidance Document. Construction BMPs generally will remain in place for 2 years or less but may be converted into permanent BMPs.
9. **Dendritic Development** means Low Impact Development (LID) and or preservation of the stream network including first order streams using the Strahler order⁶, which can lower the impact of development on the stream system. Dendritic Development is an excellent option to improve water quality; however, not required.
10. **Designated Responsible Party / Designated Owner** means the party that has overall control of operational activities on a day to day basis to ensure compliance with the rules and regulations of Control Regulation 72.

⁶ STRAHLER, A. N. 1957. Quantitative analysis of watershed geomorphology. Transactions of the American Geophysical Union 38:913–920.

11. **Detention** means the temporary storage of stormwater runoff on the surface (or below the surface) of the ground at or near where rainfall has occurred, and which is discharged or released later, typically less than 72-hours.
12. **Development** See, definition for " New Development and Redevelopment".
13. **Discharge** means the discharge of pollutants as defined in Section 25-8-103(3) C.R.S. For the purposes herein, discharges do not include land application or discharges to the ground..
14. **Division** means the Colorado Department of Public Health and Environment, Water Quality Control Division.
15. **Drainage** means: (a) the removal of surface or subsurface water from a given area either by gravity or by pumping (commonly applied herein to surface water); (b) the area from which water occurring at a given point or location on a stream originates (in such case the term is synonymous with the terms "drainage area" and "watershed"); or (c) generally, the flow of all liquids under the force of gravity.
16. **Drainage Area (or Catchment Area, Watershed, and Basin)** means: (a) the tributary area to a specific point of interest, expressed in acres, square miles, or other unit of area; or (b) the area served by a drainage system receiving storm and surface water; or by a watercourse.
17. **Erosion** means the wearing away of the land surface by water, wind, ice or other geological agents, including the detachment and movement of soil or rock fragments by water, wind, ice, or gravity.
18. **Excess Urban Runoff Volume (EURV)** means the volume difference between developed and pre-developed runoff for the range of storms that produce runoff from pervious land surfaces, generally from the mean annual to the 100-year storm.
19. **Excluded Roadway Project** means activities associated with the maintenance, repair, preservation, and associated minor modifications to roadways and appurtenant features, that do not permanently expand the original footprint of the roadway and do not increase the impervious area by less than one acre.
20. **Full Spectrum Detention (FSD)** means an extended detention basin specifically designed to capture and release 100% EURV over a 72-hour period.
21. **Governing Land Use Agency** means the municipality, county or other governmental entity that has land use authority within the Cherry Creek Watershed. Also means, and is used interchangeably herein with, Land Use Agency and Permit Holder.
22. **Grade** means: (a) the inclination of slope of a channel, canal, conduit, etc., or natural ground surface, usually expressed in terms of the percentage of number of

units of vertical rise (or fall) per unit of horizontal distance; (b) the elevation of the invert of the bottom of a conduit, canal, culvert, sewer, etc.; or (c) the finished surface of a canal bed, road bed, top of an embankment, or bottom of an excavation.

23. **Highway or Roadway Reconstruction** (Reserved).
24. **Illicit Discharge(s)** means any discharge(s) to an MS4 that is not composed entirely of stormwater except discharge(s) specifically authorized by a CDPS or NPDES permit and discharge(s) resulting from emergency fire fighting activities. Permittees should note that there are many types of illicit discharge(s) that in accordance with the permit (CORO80000) need to be effectively prohibited. Only the discharges listed in Part.1.2.a.v. can be excluded from being effectively prohibited.
25. **Imperviousness or impervious surface** means a hard surface area (e.g., parking lots, plazas, sidewalks, driveways or rooftops) that prevents or retards the infiltration of water into the soil, thus causing water to run off the surface in greater quantities and at an increased rate of flow relative to pervious areas.
26. **Individual Home Construction** means any land disturbance or development for a single home, not including land disturbances for roads, road gutters or road improvements, that disturbs less than one acre of land and where the Owner of the single home holds a permit for construction of only one dwelling within the subdivision, if any, containing the single home.
27. **Industrial and commercial activity** for the purpose of this document means manufacturing; material, and product handling, including loading and unloading; vehicle and equipment maintenance, storage, parking, and washing; waste containment, painting, material and product storage; and fueling areas.
28. **Infiltration** means: (a) water moving through the interstices or pores of a soil or other porous medium; (b) the quantity of groundwater which leaks into sewers or drain through defective joints; (c) water moving from the ground into a sewer or drain through breaks, defective joints, or porous walls; (d) the absorption of liquid water by the soil, either as it falls as precipitation, or from a stream flowing over the surface; or (e) rainfall that percolates into the ground surface and that, therefore, does not contribute directly to the stormwater runoff flow.
29. **Land Disturbance** means a man-made change in the natural cover or topography of the land, including grading, cutting and filling, building, paving, excavation, and any other activities that may result in or contribute to soil erosion or sedimentation in waters or discharge of pollutants, as identified at 5 CCR 1002-72.7.2(b) *except* individual home construction, as defined at 5 CCR 1002-72.2(14).
30. **Land Use Agency** means the municipality, county or other governmental entity that has land use authority within the Cherry Creek Watershed. Also means, and

is used interchangeably herein with, Governing Land Use Agency and Permit Holder.

31. ***Large Lot Single Family Development*** means a land disturbance greater than one acre on a single-family residential lot with an area greater than or equal to two and one-half acres in size and having a total site imperviousness, including, but not limited to roadways, building footprints, and driveways, less than ten percent gross density.
32. ***Low Impact Development (LID)*** means a comprehensive land planning and engineering design approach to managing stormwater runoff with the goal of mimicking the pre-development hydrologic regime. LID emphasizes conservation of natural features and use of engineered on-site small-scale hydrologic controls that infiltrate, filter, store, evaporate and detain runoff close to its source.
33. ***Major Drainageway*** means a stormwater conveyance that receives runoff from an area of 130 acres or more, or as defined by the land use agency, whichever is smaller in size.
34. ***Major Drainageway Plans*** means a storm drainage and water quality master plans for major drainageways prepared under the jurisdiction of the UCFCD or a local agency, and adopted by the local land use agency.
35. ***Minimizing Directly Connected Impervious Area (MDCIA)*** means a variety of runoff reduction strategies based on reducing impervious areas and routing runoff from impervious surfaces over grassy areas to slow runoff and promote infiltration. The concept of MDCIA is a key technique for reducing runoff peaks and volumes following urbanization.
36. ***Municipal Separate Storm Sewer System (MS4)*** means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels or storm drains) owned or operated by a State, city, town, county, district, association, or other public body (created by or pursuant to State Law) and designed or used for collecting or conveying stormwater; which is not a combined sewer; and which is not part of a Publicly Owned Treatment Works (POTW).
37. ***New Development and Redevelopment*** means any land disturbances that result in an increase in impervious area. (See additional limitations in Chapter I – Introduction Section C-2 “Tiered Approach to Stormwater Management”.)
38. ***Outfall Systems Plans*** means a storm drainage and water quality master plans generally for storm sewers and smaller drainageways prepared under the jurisdiction of the UDFCD or a local land use agency, and adopted by the local land use agency.
39. ***Outlet*** means the point or location where stormwater runoff discharges from a storm drainage system to a stream or drainageway.

40. **Owner** means the party or parties holding record fee title to a parcel of real property in the Cherry Creek Watershed.
41. **Permit Holder** means the municipality, county or other governmental entity that has land use authority within the Cherry Creek Watershed. Also means, and is used interchangeably herein with, Governing Land Use Agency and Land Use Agency.
42. **Post-Construction BMPs** means BMPs, either structural or nonstructural, required for new development, redevelopment or land disturbance activities under Chapter III – Post Construction BMP Requirements of CR-72.7 Guidance Document. Post-construction BMPs will remain in place indefinitely.
43. **Permeability** means the property of a material that permits movement of water through it when saturated and actuated by hydrostatic pressure.
44. **Pervious** means the property of a material that permits water to pass through the material.
45. **Porous Landscape Detention (PLD)** means a stormwater quality BMP which of a low lying vegetated area underlain by a permeable media with an underdrain. A shallow surcharge zone exists above the porous landscape detention for temporary storage of the WQCV. Also known as rain garden or bioretention facility.
46. **Precipitation** means any moisture that falls from the atmosphere, including but not limited to snow, sleet, rain, and hail.
47. **Retention Storage** means the storage of stormwater runoff without release. Stormwater runoff is retained to infiltrate, evaporate, or stored for other purposes.
48. **Rural Road Construction and Maintenance** means land disturbance greater than one acre for rural residential roads and rural collector roads that serve or are adjacent to large lot single family developments. Rural Roads are typically characterized by having parallel ditches for conveyance of storm runoff, rather than curb and gutter. Although urban roadways sometimes use roadside ditches for runoff conveyance, they are not classified as rural roads. In the context of this regulation, the word road does not include temporary haul roads used for construction purposes. Construction activities occurring within a Census Designated Urbanized Area are excluded from this definition.
49. **Sediment** means particulate soil matter, either mineral or organic, that is suspended and transported by wind, ice or water or the matter deposited as a result of sedimentation.
50. **Storage** means the detention, either temporary or permanent, of a portion of stormwater runoff that provides for sediment and debris collection.

51. ***Storm Drainage System*** means all facilities used for conducting stormwater runoff through and from a drainage area to the point of final outlet, consisting of any or all of the following: conduits and appurtenant features, canals, channels, ditches, streams, gulches, gullies, flumes, culverts, streets, and pumping stations.
52. ***Stormwater*** means stormwater runoff, snow melt runoff, surface runoff and drainage.
53. ***Strahler Order*** means each join of two stream segments within a river network is treated as a node in a tree, with the next segment downstream as its parent. When two first-order streams come together, they form a second-order stream. When two second-order streams come together, they form a third-order stream and so on. It provides a numerical measure of river network branching complexity⁷.
54. ***Stream Preservation Areas*** means those areas within the Cherry Creek Watershed that transport a higher percentage of stormwater runoff and associated pollutants to the water system and Reservoir. Stream Preservation Areas are the Reservoir, all of Cherry Creek State Park, drainage and discharge to the Park within 100 feet of the Park Boundary; and all lands within the 100-year floodplain of Cherry Creek and its tributaries, as defined by FEMA and the Urban Drainage and Flood Control District. Note that the 100-year floodplain is intended to be a reasonable and more easily administrable approximation for the alluvium, which is to receive additional protections.
55. ***Southeast Metropolitan Storm Water Authority (SEMSWA)***. An Authority formed by intergovernmental agreement to provide stormwater management services for the City of Centennial, Arapahoe County, Arapahoe Water and Waste Water Authority, East Cherry Creek Valley Water and Sanitation District, and the Inverness Water and Sanitation District.
56. ***Tier 1 development and redevelopment*** means any land disturbance less than one acre that is developed independently of a larger common plan of development or sale, and which results in less than 500 square feet of imperviousness for new development or 500 square feet of increased imperviousness for redevelopment⁸.
57. ***Tier 2 development and redevelopment*** means any land disturbance less than one acre that is developed independently of a larger common plan of development or sale, and which results in more than 500 square feet but less than 5,000 square feet of imperviousness for new development, or more than 500 square feet and less than 5,000 square feet of increased imperviousness for redevelopment, including disturbances of existing impervious areas.

⁷ STRAHLER, A. N. 1957. Quantitative analysis of watershed geomorphology. Transactions of the American Geophysical Union 38:913-920

⁸ Definition from 5 CCR 1002-72; from the version with an effective date of November 30, 2012.

58. **Tier 3 development and redevelopment** means any land disturbance greater than one acre, or which results in more than 5,000 square feet of imperviousness for new development or 5,000 square feet of increased imperviousness for redevelopment, including disturbances of existing impervious areas. (See additional limitations for Tier 3 in Chapter I – Introduction Section C-2 “Tiered Approach to Stormwater Management”.)
59. **Trails** means permanent access areas constructed primarily for the purpose of recreation but also provide access for operations and maintenance. This includes trails that consist, for at least some portion of the trail, of sidewalks adjacent to roadways.
60. **Volume 1 and 2** means the most current version of the Urban Storm Drainage Criteria Manual - Volume 1 (or Volume II) authored by UDFCD and effective on the date of this CR-72 Guidance Document.
61. **Volume 3** means the most current version of Volume 3, Best Management Practices, of the Urban Storm Drainage Criteria Manual authored by UDFCD and effective on the date of this CR-72 Guidance Document.
62. **Water Quality Capture Volume (WQCV)** means the volume equivalent to the runoff from an 80th percentile storm, meaning that 80 percent of the most frequently occurring storms are fully captured and treated and larger events are partially treated.
63. **Waters of the state or State Waters⁹** means any and all surface and subsurface waters which are contained in or flow in or through this state, but does not water in sewage systems, waters in treatment works of disposal systems, waters in potable water distribution systems, and all water withdrawn for use until use and treatment have been completed.
64. **Wellhead Protection Area** means the surface and subsurface area surrounding a water well or well field supplying a public water system, through which contaminants are likely to move toward and reach such water well or well field (Section 1428 of the 1986 federal Safe Drinking Water).
65. **Wetland** means areas that are inundated or saturated by surface or groundwater 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 and promotes development of and sustains hydric (wetland) soils. Wetlands generally include swamps, marshes, bogs and similar areas.

⁹ Definition from 5 CCR 1002-61; from the version with an effective date of April 30, 2017.

G. CONFLICT WITH OTHER REQUIREMENTS

In the event that the BMP requirements in CR-72.7 Guidance Document conflict with other state or local drainage or stormwater quality requirements, the more stringent requirements shall govern.

H. ADDITIONAL EXCLUSION

An additional exclusion is a modification to strict compliance with the provisions of this CR-72.7 Guidance Document that is not an Automatic or Authorized exclusion under 5 CCR 1002-72. Automatic and Authorized Exclusions from 5 CCR 1002-72 are identified in this CR-72.7 Guidance Document in the individual chapters¹⁰. An Additional Exclusion may be granted, provided it meets the following requirements:

1. **Exclusion Criteria.** Additional Exclusion from provisions of this CR-72.7 Guidance Document may be granted on a site-specific basis, provided:
 - a) It can be reasonably shown that excluding the activity will not pose an increased threat to water quality, or that the cost of administering the program for a specific activity with low risk of stormwater pollution outweighs the benefits to water quality, or
 - b) The Owner's proposed BMP alternative for construction and/or post construction BMP is deemed to be have an equal or greater level of performance, and
 - c) The Division approves the exclusion.
2. **Exclusion Requests.** A request for an Additional Exclusion shall be submitted in writing to the MS4 permittee and shall include the following information:
 - a. Specific variance requested and the requirement(s) of the CR-72.7 Guidance Document from which the Owner seeks an exclusion, and
 - b. Description of the technical requirements and specifications of proposed alternative and supporting technical documentation that the proposed alternative meets the criteria at 72.7 Guidance Document Chapter I – Introduction, Section H(1) – Exclusion Criteria, or
 - c. Explanation why the construction or post-construction BMP requirements in this CR-72.7 Guidance Document cannot be met.
3. **Exclusion Procedure.** The procedure to obtain an Additional Exclusion is:

¹⁰ Note that Automatic and Authorized exclusions are also found in Control Regulation 72 at 72.7.2(b)(3) for construction BMPs, at 72.7.2(c)(4) for post construction BMPs, and at 72.7.2(c)(8) for Stream Preservation Areas.

- i. The Owner shall submit two copies of the written request to the MS4 Permittee and one electronic PDF copy to the Authority.
- ii. The Authority will provide the Division with a copy of the document, requesting their comment on the proposed exclusion.
- iii. The Division will review the request and shall make a final decision whether to approve or deny the proposed exclusion.
- iv. The Authority will review the request and comments from the Division and make recommendations to the land use agency regarding the proposed exclusion.
- v. The Land Use Agency shall make the final determination after considering the Division's final decision and the Authority recommendation.

CHAPTER II - CONSTRUCTION BMP REQUIREMENTS

Presented in this Chapter of CR-72.7 Guidance Document are additional requirements for construction BMPs.

A. REGULATED ACTIVITIES

Temporary construction erosion and sediment controls ("Construction BMPs") shall be implemented for all land disturbances identified at Chapter I - Introduction, Section E(1) – Regulated Activities within the Cherry Creek Watershed. All Construction BMPs for land disturbances shall be provided and maintained in accordance with the requirements of, and be approved by the governing land use agency prior to commencement of any land disturbances. In the implementation of this CR-72.7-Guidance Document, the local land use agency requirements, may be more restrictive.

B. DESIGN CRITERIA AND STANDARDS

Owners shall prepare a construction plan describing grading, erosion, and sediment control for their Development and obtain approval from the governing land use agency prior to commencement of land disturbances on their property. If requested by the land use agency, the Authority may review plans for construction BMPs and submit recommendations to land use agencies regarding compliance of the plans with this CR-72.7 Guidance Document.

C. REQUIRED CONSTRUCTION BMPS

Additional requirements for construction BMPs are identified at Chapter II – Construction BMP Requirements, Section D - Individual Home Construction, Section E - Inspection\Operation and Maintenance, and Section F - Exclusions.

Additional construction BMPs requirements for land disturbances within a Stream Preservation area are identified at Chapter VI – Stream Preservation Areas of this CR-72.7 Guidance Document.

Additional construction BMPs may be required by the Authority for stormwater discharges from land disturbances not identified in Chapter I - Introduction, Section E(1) – Regulated Activities, if the Authority determines that the discharge may be detrimental to reducing nutrient concentrations in storm runoff to the maximum extent practicable.

D. INDIVIDUAL HOME CONSTRUCTION

Individual Home Construction, including any land disturbance or development for a single home, (not including land disturbance for roads, road gutters or road improvements), that disturb

less than one acre of land and where the Owner of the single home holds a permit for construction of only one dwelling within the subdivision, if any, containing the single home, must provide at least one sediment entrapment BMP before any stormwater leaves the construction site. Owners are not required to satisfy other requirements for Construction BMPs at Chapter II _ Construction BMP Requirements, Section C – Required Construction BMPs.

E. INSPECTION/OPERATION AND MAINTENANCE

1. **Inspection.** Owners and/or designated owner shall comply with the inspection requirements set forth in the governing land use agency’s stormwater permit criteria.
2. **Operation and Maintenance.** Owner shall comply with the operation and maintenance requirements set forth in the governing land use agency’s stormwater permit criteria.

F. EXCLUSIONS

1. **Automatic Exclusions.** The following activities are automatically exempt from Construction BMP requirements in Chapter II _ Construction BMP Requirements of this CR-72.7 Guidance Document without submitting a request for exclusion (See CR-72.7.2(b)(3) - Exclusions):
 - a. Agricultural activities, as defined at Chapter I - Introduction, Section (F)(1) – Agricultural Activity;
 - b. Emergency and routine repair and maintenance operations for all underground utilities; and
 - c. Land disturbances at approved residential or commercial subdivisions, where the subdivision already has approved Construction BMPs and Permanent BMPs installed and operating for the entire subdivision, approved in compliance with Control Regulation CR-72.7, and where the original owner who obtained approval retains legal authority.
 - d. Routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of a facility. Maintenance operations performed by the permittee may still be covered under the Municipal Operations minimum control measure.
 - e. Emergency operations related to flood, fire and other force majeure.

2. **Authorized Exclusions**

- a) **Activities.** Exclusions from Construction BMPs for the following construction activities may be granted on a site-specific basis, upon approval of a written request for exclusion:
- (1) Construction of a sidewalk or driveway authorized by a valid permit; and
 - (2) Underground utility construction including the installation and maintenance of all utilities under hard-surfaced roads, streets, or sidewalks provided such land-disturbing activity is confined to the area which is hard-surfaced and provided that stormwater runoff and erosion from soil stockpiles are confined and will not enter the drainage system.
 - (3) Authorized exclusions (See CR-72.7.2(b)(5)(i)(A) – Phase Construction) may be granted to the 40-acre limit for removal and storage of cut material where (a) geotechnical limitations restrict the use of temporary or permanent stabilization of the stored material (e.g., swelling soils, rock) and (b) when the Owner can demonstrate that the 40-acre limit is physically and/or financially impracticable. For sites requesting this exclusion, a phasing and earthwork quantities plan shall be submitted to and, following adequate review, approved by the land use agency prior to the commencement of land disturbance activities. Submittal requirements include:
 - (i) Plan showing phasing of cut and fill volumes and locations for each phase and project totals.
 - (ii) Plan showing earthwork quantities for cut and fill volumes and locations for each phase and project totals.
 - (iii) Plan showing specific erosion and sediment controls for each phase.
- b) Additional Exclusions (see CR-72.7.2(b)(3)(iii) – Additional Exclusions). Requests for exclusion shall follow requirements outlined in Chapter I – Introduction, Section H - Additional Exclusions.

CHAPTER III - POST-CONSTRUCTION BMP REQUIREMENTS

Presented in this Chapter of CR-72.7 Guidance Document are additional requirements for post-construction BMPs.

A. REGULATED ACTIVITIES

Post-Construction BMPs controls shall be implemented for new development and redevelopment within the Cherry Creek Watershed, as set forth below. All post-construction BMPs for new development and redevelopment shall be approved by the land use agency prior to commencement of any land disturbances. In the implementation of this CR-72.7-Guidance Document, the local land use agency, may be more restrictive.

Post-construction BMPs shall consist of an individual practice or a combination of practices to prevent the discharge of pollutants from the land disturbance on a permanent basis. Combination BMPs, such as extended detention basins followed by grass swale, or full spectrum detention basins, are the preferred options in the Cherry Creek Watershed because they provide ancillary benefits. Individual Home Constructions, as defined at Chapter I - Introduction, Section F - Definitions, that satisfy the criteria at Chapter II Construction BMP Requirements, Section D – Individual Home Construction, are exempt from these Post-construction BMP requirements.

The following additional requirements are based on the technology-based approach to water quality. This means that implementation of the BMP is expected to achieve the desired water quality benefits, and in this case a reduction in nutrient loads or concentrations to Cherry Creek, Cherry Creek tributaries, and Cherry Creek Reservoir. Nutrient removal effectiveness is a function of the type of BMP and is reported in Volume 3 and in Urban Runoff Quality Management¹¹ for various BMPs. Whereas the BMPs focus on nutrient immobilization, they also provide multiple benefits, including removal of other pollutants including sediments.

As additional information on BMP performance is obtained, expected pollutant reduction benefits may change and may require adjustments to the following additional BMP requirements.

For post-construction new development and redevelopment, the Commission adopted a three-tiered approach to stormwater management BMPs to coincide with the requirements found in Regulation #61 (5 CCR 1002-61), while specifically addressing concerns within the Cherry Creek Watershed. The definitions of tier development is found at Chapter I - Introduction, Section

¹¹ American Society of Civil Engineers 1998. *Urban Runoff Quality Management ASCE Manual and Report on Engineering Practice No. 87*

F - Definitions. The Commission also excluded certain limited activities identified as insignificant contributors to water quality degradation from 5 CCR 1002-72.

B. DESIGN CRITERIA AND STANDARDS

1, Minimum Requirements.

Tier 3 Development and Redevelopment Tier 3 New Development and Redevelopment shall install and operate post-construction BMPs that provide water quality capture volume (WQCV) designed and constructed to capture and treat, at a minimum, 80 percent of the most frequently occurring storms and partially treat larger storm events. All BMPs must be designed in accordance with good engineering practices. One or more of the following BMPs shall be required to meet the WQCV:

- a) **Constructed Wetland Channel.** Constructed wetland channel, in conjunction with extended detention basin, retention pond, constructed wetlands basin, porous pavement detention, porous landscape detention, or sand filter extended detention watershed.
- b) **Grass Swale.** Grass swale in combination with porous pavement detention or porous landscape detention.
- c) **Constructed Wetland Channel.** Constructed wetland channel preceded by modular block porous pavement.
- d) **Minimizing Directly Connected Impervious Area (MDCIA).** This combination BMP of MDCIA in conjunction with extended detention watershed retention pond, constructed wetlands basin, porous pavement detention, porous landscape detention, or sand filter extended detention basin. At a minimum, for MDCIA, all impervious areas at the development must flow over grass buffer trips before reaching a stormwater conveyance system.
- e) **Extended-Detention Basins (Dry Ponds).** Extended detention basins provide for the slow release of the water quality capture volume, which promotes sedimentation of the particulate form and adsorption of some soluble form of pollutants.
- f) **Full Spectrum Detention Basin.** Full spectrum detention basins that are designed to capture and slowly release over a 72-hour period 110% of excess urban runoff volume (EURV), called full spectrum detention, provide additional water quality benefits by reducing peak flows from developed watershed to pre-developed conditions for the mean annual to 100-year storms. This reduction in peak flows for the full spectrum of storm events reduces shear stress on the receiving waterway to values below estimated critical levels which minimizes stream degradation.

- g) **Retention Ponds (Wet Ponds).** Retention ponds have a permanent pool of water, some of which is replaced by stormwater during storm events. Retention ponds provide treatment by improved sedimentation, adsorption of dissolved fraction onto vegetation and substrate, and by biological uptake by shoreline vegetation.
- h) **Constructed Wetlands Basin.** Shallow retention ponds with wide bottoms and flat grades create constructed wetlands in the presence of a sufficient amount of water to maintain vegetation. They provide treatment by sedimentation, filtering, adsorption and uptake by vegetation and microorganisms.
- i) **Porous Pavement Detention.** Porous pavement detention consists of modular block pavement (perforated concrete slab units filled and underlain with gravel). This BMP provides treatment by capturing sediment (adsorption), filtration, and infiltration (if suitable subsoils).
- j) **Porous Landscape Detention¹².** This Post-construction BMP consists of a low lying vegetated area underlain by a sand bed with an under-drain pipe. Runoff ponds in the vegetated zone and infiltrates into the underlying sand bed, filling the void spaces in the sand.
- k) **Sand Filter Extended Detention Basin.** A sand filter extended detention basin consists of runoff storage underlain by a sand bed, with an under drain system. This BMP removes pollutants through settling and filtering.
- l) **Runoff Reduction Practices.** A combination of planning techniques to reduce runoff peaks, volumes, and pollutant loads from urbanizing areas that includes low impact development (LID) strategies (including dendritic development) and MDCIA to reduce unnecessary impervious areas and route runoff from impervious surfaces over permeable areas to slow runoff and promote onsite storage and infiltration. The effectiveness of this BMP to reduce peak flows, volumes, and pollutant loads shall be demonstrated by site specific calculations and analysis approved by the MS4.
- m) **Other BMPs.** The local land use agency (permittee) will consider other BMPs , or a combination of more than one of the above identified BMPs, or a combination of one of the above identified BMPs and one or more of the “Other BMPs” that meet the minimum requirement to reduce projected future, total nutrient loads and concentrations.

WQCV Alternatives. The permittee may allow alternative BMPs that do not use the WQCV, if they are shown to have comparable or better nutrient concentration reduction characteristics for the given use when properly designed, implemented and maintained.

¹² For the purpose of this Guidance Document, the phrase porous landscape detention is used and is considered the same as rain garden term used in the USDCM, Volume 3, Best Management Practices.

Tier 2 Development and Redevelopment Tier 2 New Development and Redevelopment shall install, operate, and maintain post-construction BMPs that are not required to include WQCV, but are required to meet one or more of the following conditions:

- a) The WQCV storm event is assumed not to leave the site, as demonstrated by suitable hydrologic analysis. See Appendix A - WQCV Hydrologic Analysis, for guidance regarding this analysis;
- b) Runoff is discharged as sheet flow across a grass buffer area, designed in accordance with Urban Drainage Flood Control District Volume 3 requirements.
- c) Runoff is discharged from the site through a grass swale in combination with implementation of Minimize Directly Connected Impervious Areas (MDCIA) practices.
- d) Runoff is discharged from the site through a constructed wetland channel.
- e) Runoff is discharged across undisturbed and vegetated land a minimum distance of 50 feet or 3 times the distance criteria for grass buffers, whichever is greater, with a slope not exceeding 4 percent over that distance;
- f) Allowed discharge of a storm event adequately protects water quality, as demonstrated by a hydrologic analysis accepted by Authority; or
- g) Alternative BMPs and/or site condition requirements may be used if they are shown to have comparable or better nutrient removal characteristics for the given use, in comparison to the above listed BMPs/site condition requirements, when properly designed and implemented. These BMPs/ site condition requirements must be determined to be acceptable by the Authority on a case-by-case basis, or, if appropriate, may be added to the menu of acceptable BMPs.

Tier 1 Development and Redevelopment Tier 1 New Development and Redevelopment are not required to provide post-construction BMPs, but are encouraged to implement runoff reduction measures.

2. **Plan for Post-construction BMPs.** Owners shall prepare a plan that includes post-construction BMPs and obtain approval from the governing land use agency prior to commencement of land disturbances for new development or redevelopment on their property. If requested by the land use agency, the Authority may review plans and submit recommendations to land use agencies regarding compliance of the plans with this CR-72.7 Guidance Document.

The plan for post-construction BMPs may be incorporated with the appropriate drainage report (depending on the land-use agency) or may be a separate report and shall include:

- a. Narrative description of land disturbance for new development and redevelopment project;
 - b. Location map showing location of proposed project;
 - c. Site map showing drainage area, areas of land disturbance, new development and redevelopment, drainage flow arrows and proposed locations of post-construction BMPs;
 - d. Description of soil conditions and geologic features of site;
 - e. Site map showing existing topography of site; proposed excavation, grading and fill areas; and proposed final topography of site;
 - f. Relation to Major Drainageway and Outfall Systems plans, and stormwater quality plans for the region and Cherry Creek Watershed;
 - g. Schematics or diagrams of proposed BMPs.
 - h. Detailed description, design criteria and specifications, technical details, and location of post-construction BMPs to be implemented and analysis as to how BMPs (combination or individual) satisfy the requirements at Chapter III – Post Construction BMP Requirements, Section B(1) – Minimum Requirements.
 - i. Detailed description, final design criteria and specifications, and location of stream stabilization measures to be implemented, where required.
 - j. Analysis of how installation of BMPs complies with the operation and maintenance requirements enumerated at Chapter III – Post Construction BMP Requirements, Section D – Minimum Requirements and identification of access for operations and maintenance;
 - k. Maintenance and inspection protocols to ensure continued effectiveness of BMPs and stream stabilization measures, and commitments from responsible agency/Owner to maintain post-construction BMPs.
 - l. Schedule and plan regarding performance of operation and maintenance for BMPs; and
 - m. Procedures for dedication by easements or other legal means for access at the sites for operation, maintenance, and inspection of BMPs.
3. **Regional Facilities.** Owners may, and are encouraged to, collaborate with other developments and Owners to establish regional water quality facilities. Regional facilities that include WQCV and nutrient removal requirements for all tributary areas, may be more cost-effective than individual-site BMPs and may be integrated into open space, parks, and golf courses. However, regional facilities do not exempt

an Owner from protecting state waters from runoff from his site and in some cases may require additional onsite BMPs to meet this requirement. See 5 CCR 1002-72.7.2(c)(2).

- a) **Discharge to State Waters.** If the Development discharges to the waters-of-the-state, then the owner must, as a minimum, implement on-site BMP, such as a grass-swale, or other BMPs that are designed in accordance with Volume 3. For example, if a new development is served by a regional, stormwater quality facility designed in accordance with Volume 3, and stormwater from the development is discharged to an open conveyance system before reaching the regional facility, then onsite BMPs must also be provided. The onsite BMP need not be based on WQCV, but can be other approved BMPs, such as those requirements identified for Tier 2 development at Chapter III – Post Construction BMP Requirements, Section 1 – Minimum Requirements. At the discretion of the land use agency, new development or redevelopment projects may include channel reclamation in accordance with Chapter III – Post Construction BMP Requirements, Section-C – Channel or Stream Reclamation of this CR 72.7 Guidance Document instead of additional onsite BMPs.
- b) **Not a discharge to State Waters.** If a regional BMPs is located prior to discharging into state waters, then the regional BMPs can be used to meet the post-construction requirement and additional on-site BMPs may only be needed to assist in the function of the regional BMPs,

If a new development or redevelopment project discharges to a regional stormwater quality facility through a storm drain, then the discharge is not considered to be into State Waters and additional BMPs are not required. Owners are still encouraged to implement on-site BMP to further improve storm water discharge quality.

4. **Stream Preservation Area.** If Tier 2 or Tier 3 New Development or Redevelopment occurs within a Stream Preservation area , then the Owner must comply with this CR-72.7 Guidance Document at Chapter VI - Stream Preservation Areas. If a regional facility incorporates special provisions for stream preservation areas, the Owner may be exempt from implementing additional requirements when a land disturbance occurs within a stream preservation area.

C. CHANNEL OR STREAM RECLAMATION

1. Additional BMP Requirements

The following additional measures are required for Tier 3 New Development or Redevelopment if a major drainageway or outfall drainageway lies within the development, unless determined otherwise by the governing land use agency:

- a. Comply with stream stabilization or reclamation measures identified in major drainageway plans and outfall system plans by including the

construction of stabilization, or reclamation, measures as a condition of development, regardless of development encroachment into the floodplain. The governing land use agency may require modification to the stream stabilization, or reclamation, plan, if the existing plan is outdated or no longer adequate or appropriate.

- b. When adopted major drainageway or outfall system plans are not available, prepare a site-specific, stream reclamation plan for the major drainageways that meet the requirements at Chapter III – Post Construction BMP Requirements, Section C(3) – Channel or Stream Reclamation. Include construction of the identified measures as a condition of development, regardless of development encroachment into the floodplain.

2. **Basis for Requirements**

The impact of urbanization on ephemeral, natural drainageways and their tributaries is the increase in magnitude, frequency of occurrence, rate, and duration of storm flows in the channel, all of which combine to accelerate erosion. The Center for Watershed Protection¹³ reports that impervious watershed cover as little as 10% is sufficient to have a negative influence on stream quality. In addition, the rocky, steep terrain in the upper watershed near the basin divide further aggravates these impacts on natural drainageways, making them more sensitive to increases in imperviousness caused by development.

One approach used during development is to restrict all land disturbances from the 100-year floodplain, which often does not require modification of the channels to account for development impacts. This approach, although it may meet minimum development requirements of land use agencies, does not adequately address increased erosion of the channel.

Low Impact Development (LID) and/or preservation of the Dendritic Stream System are approaches that can lower the impact of development on the stream system. These are suggested approaches to be considered; however, they are not required.

Dendritic development involves the preservation of certain elements of existing topography from the earliest stages of site development, to keep in place existing streams up to first order (as defined by the Strahler method), and to leverage these existing features for the infiltration and conveyance of stormwater. These corridors can subsequently be developed as parkland or to contain connector trails for recreation, as well as serve as areas to mitigate storm surge flows. Dendritic development can result in higher property values, reduce long term stormwater conveyance maintenance costs, and provide other ecological benefits. Higher property values may be created in residential settings, for example, by aligning lots along the length of the preserved streams and providing

¹³ Center for Watershed Protection, March 2003. *Impacts of Impervious Cover on Aquatic Systems*. Watershed Protection Research Monograph No. 1.

premium views of natural habitat and parkland. Stormwater conveyance maintenance costs are reduced because the natural streams can replace pipes and other engineered structures, and result in overall reduced stormwater base and peak flows. Finally, ecological benefits can include increased infiltration to groundwater (resulting in lower stormwater conveyance costs), improved water quality through the use of buffer strips and other natural sediment-reducing features, and can create connected ecological habitats, which support wildlife as well as a host of related ecological services valued by society.

3. **Channel and Stream Reclamation Defined.**

A reclaimed channel or stream is one that has been designed and constructed:

- a. **Based on:** hydrology (i.e., peak storm runoff rates and volumes, and base flow conditions) from the projected, fully urbanized tributary watershed.
- b. **To include:** but not limited to, excavation and grading; placement of fill; construction of drop structures, channel bed and bank protection measures; and placement of vegetation that protects the channel and floodplain area of the conveyance. Note that the use of check structures, as defined at Chapter 1 - Introduction, Section F - Definitions, may not be acceptable as channel reclamation measures under this paragraph.
- c. **With:** a channel geometry and slope that: (i) increases the connection between the channel and its floodplain; (ii) minimizes erosion and sedimentation within the channel; (iii) encourages growth of native vegetation along the channel banks, riparian area, and in the adjacent floodplain, and (iv) minimizes disturbance of existing, natural vegetation. (See Volume 2, Chapter 8, Sections 4 and 5).
- d. **To include:** adequate provisions for operations and maintenance, in accordance with requirements in the Volume 1 and 2.

4. **Reclamation Plan Requirements**

When a channel or stream reclamation plan is not available for the drainageway, a reclamation plan shall be prepared and included with final drainage reports for the development and shall include measures based on those outlined in this Chapter III – Post Construction BMP Requirements, Section C(3) – Channel or Stream Reclamation:

D. OPERATION AND MAINTENANCE

The land use agency shall develop, implement and enforce a program that ensures adequate long-term operation and maintenance of BMPs.

E. PROTECTION OF ALLUVIAL DRINKING-WATER SUPPLIES

Some stormwater BMPs promote infiltration into the subsurface soils, along with pollutants in stormwater not immobilized by surface components of the BMP. Depending on the location of the BMP in the watershed, the infiltrated pollutants can migrate into the groundwater and eventually reach the Cherry Creek alluvium, which is also a drinking water supply. Whereas, the soil is a natural filter that immobilizes pollutants, some contaminants, such as chlorides, nitrates, and organics, can also dissolve and move with the groundwater.

The general potential for groundwater contamination from stormwater depends on the prevalence of contaminants in stormwater and the tendency to remain dissolved (more mobile). The U.S. Environmental Protection Agency (EPA) believes the largest threat to groundwater from stormwater results from spills and chemical misuse.

Therefore site-specific design requirements for residential, commercial, and industrial land-use BMPs are necessary to protect the Cherry Creek alluvial groundwater source, and BMPs identified at Chapter IV – Industrial and Commercial Activity are an essential component of protecting groundwater supplies. In addition, BMPs that are specifically designed for infiltration shall incorporate the following design considerations.

1. **Minimum Setback from Drinking Water Wells.** The travel distance of a contaminant will vary depending on factors such as soil type, permeability, groundwater flow, and water table fluctuations. BMPs that are specifically designed for infiltration with no impermeable barrier shall:
 - a. Maintain setbacks greater than 400 feet from any alluvial water well, unless a site-specific susceptibility analysis¹⁴ demonstrates a Low category susceptibility.
 - b. Not be installed within a designated wellhead protection area. If the proposed BMP is within a designated wellhead protection area, but the distance from the BMP and the wellhead is greater than 400 feet, the BMP may be allowed by the Authority provided written approval from the water utility\owner is obtained and provided to the Authority. The water utility\owner may require modifications to BMP design to enhance groundwater protection, but modifications should not reduce BMP requirements identified in Chapter III – Post Construction BMP Requirements.
2. **Minimum Separation from Water Table.** Since many contaminants adsorb to soil particles, a soil filter should be retained between the bottom elevation of the BMP and the seasonal high water table. All BMPs shall maintain a minimum of 10 feet between the lowest BMP elevation and the seasonal high water table.

¹⁴ CDPHE, Water Quality Control Division May 2000. *State of Colorado Source Water Assessment and Protection (SWAP) Program Plan.*

F. HIGHWAY AND ROADWAY RECONSTRUCTION

For Highway and Roadway Reconstruction projects that result in land disturbance less than one acre but an increase in impervious area by more than 5,000 square feet, Owners shall, to the maximum extent practicable (MEP), implement post-construction BMPs required by this Chapter. With approval of the Authority and local land use agency, Owners shall:

1. Implement post-construction WQCV type BMPs required by CR-72.7 Guidance Document, Chapter III - Post Construction BMP Requirements for the land disturbance area of the project where WQCV type BMPs are practicable.
2. For land disturbance areas of the project where WQCV type BMPs are not practicable, Owners shall:
 - a. Implement WQCV BMPs for a portion of the land disturbance area of the project with an equivalent or larger area equal to the additional impervious area created by the project, and.
 - b. For the remaining land disturbance area of the project and to the MEP:
 - i. Implement non-WQCV BMPs, in accordance with, Volume 3 or
 - ii. Capture and filter runoff from paved areas using proprietary or other BMP methods that capture sediment, debris, and floatables.

The following example is provided for clarification and not limitation. If the land disturbance area includes 40,000 square feet of imperviousness of which 6,000 square feet is new imperviousness, the redevelopment is Tier 3. The Owner evaluates the project and determines that WQCV type BMP is feasible to treat 10,000 square feet of imperviousness, some existing and some new imperviousness. In addition, non-WQCV type BMPs are feasible for an additional 20,000 square feet of imperviousness. The Owner provides documentation of their findings and investigations to the Authority and governing land use agency for review and approval. To meet the requirements of this section the owner would then:

1. Implement WQCV BMP for 10,000 square feet of imperviousness.
2. Implement non WQCV BMP for 20,000 square feet of imperviousness.

G. EXCLUSIONS

1. **Automatic Exclusions.** The following activities are exempt from post-construction BMP requirements under Chapter III – Post Construction BMP Requirements, without a written request for an exclusion (see CR-72.7.2(c)(4)(i) – Automatic Exclusions):
 - a. Agricultural Activities, as defined in Chapter I - Introduction, Section (E)(1) – Agricultural Activities;

- b. Emergency and routine repair and maintenance operations for all underground utilities; and
- c. Land disturbances at approved residential or commercial subdivisions, that already have adequate Post-construction BMPs installed and operating for the entire subdivision, approved in compliance with the CR-72.7 Guidance Document and with adequate capacity to treat any additional discharges.
- d. Routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of a facility. If the activity increases impervious area by more than 500-square feet, post-construction BMPs are required in accordance with this Chapter.
- e. Emergency operations related to flood, fire, or other force majeure that maintain the original line and grade, hydraulic capacity or original purpose of the facility, and
- f. Land disturbance to undeveloped land that will remain undeveloped following the disturbance and will be reclaimed in accordance with CR-72.7 Guidance Document Chapter II - Construction BMP Requirements.

2. **Authorized Exclusions.**

- a. **Activities.** Exclusion from Post-construction BMPs may be granted for the following conditions on a site-specific basis and upon approval of a written request to the land use agency for an exclusion (see CR-72.7.2(c)(4)(ii)):
 - 1. Construction of a sidewalk or driveway authorized by a valid permit
 - 2. Underground utility construction including the installation and maintenance of all utilities under hard-surfaced roads, streets, or sidewalks provided such land-disturbing activity is confined to the area which is hard-surfaced and provided that stormwater runoff and erosion from soil and material stockpiles are confined and will not enter the drainage system.
 - 3. Rural road construction and maintenance, provided that owner provides post construction BMP in accordance with this CR-72.7-Guidance Document, Chapter VII – Rural Road Construction and Maintenance.
 - 4. Large Lot single family development, provided that owner provides post construction BMP in accordance with this CR-72.7-Guidance Document, Chapter IX – Large Lot Single Family Development.
 - 5. Trails construction, provided that owner provides post construction BMP in accordance with this CR-72.7-Guidance Document, Chapter X – Trail Construction.

- b. **Additional Exclusions.** Requests for exclusion shall follow requirements outlined in Chapter I – Introduction, Section H - Additional Exclusions.

CHAPTER IV - INDUSTRIAL AND COMMERCIAL ACTIVITY

Presented in this Chapter of CR-72.7 Guidance Document are additional, post-construction BMPs and reporting requirements for all new development and redevelopment when there is a potential for an illicit discharge. The authority to regulate these discharges is found at 5 CCR. 1002-72.7.2(c)(7) – Additional BMP Requirements. Most often the illicit discharge potential is associated with commercial and industrial type land uses, but not always.

Federal regulations define an illicit discharge as “...any discharge to an MS4 that is not composed entirely of stormwater...” with some exceptions. These exceptions include discharges from Colorado Discharge Permit System (CDPS)-permitted industrial sources and discharges from fire-fighting and specific municipal activities. Illicit discharges are considered “illicit” because MS4s are not designed, or allowed by law, to accept, process, or discharge such non-stormwater wastes.

Illicit stormwater discharges may contain fuel, oil, solvents, degreasing agents, waste automotive fluids, acids, lubricants, caustic fluids, paint, paint thinners and solvents, dust from sanding and grinding, sand blasting residue, metal and wood shavings, industrial chemicals, pesticides, herbicides, fertilizers, lawn care products, hazardous wastes, sediment, dirt, toxic substances, trash and other pollutants. Example commercial and industrial activities where these illicit discharges may occur, if allowed to come in contact with precipitation, include:

- Manufacturing
- Material and product handling, including loading and unloading
- Vehicle and equipment maintenance, storage, parking, and washing.
- Waste containment.
- Painting.
- Material and product storage.
- Fueling areas

A. REGULATED ACTIVITIES

Additional post-construction BMPs and reporting shall be implemented for all new development and redevelopment identified at Chapter I - Introduction, Section E(1) – Regulated Activities to control industrial and commercial activities that may come in contact with precipitation and result in an illicit discharge. All requirements at Chapter III - Post Construction BMP Requirements shall apply, unless specifically noted otherwise. All post-construction BMPs for land disturbances shall be approved by the land use agency prior to commencement of any land disturbances. In the implementation of this CR-72.7-Guidance Document, the local land use agency, may be more restrictive.

Additional post-construction BMPs are *not* required if the Owner has obtained a No Exposure Certification from the Colorado Department of Public Health and the Environment (CDPHE), which certifies that all industrial activities and materials are completely sheltered. However, a copy of the Certification shall be included with the drainage report, in accordance with this CR-72.7 Guidance Document Chapter IV (C)(2)(a)(3) – Reporting Requirements.

B. ADDITIONAL REQUIREMENTS

If the governing land use agency or the Authority determine that there is a potential for an illicit discharge, the following additional post-construction BMPs shall be implemented, at a minimum, that include exposure controls, treatment controls, and preventions measures as follows:

1. **Exposure Controls.** Owner shall implement BMPs that reduce the potential for stormwater coming in contact with precipitation by installing covers or enclosures for all industrial activities by housing the activities under roofs or within buildings or the Owner shall implement all of the following:
 - a. Providing secondary containment area to collect leaks and spills, or other illicit discharges, of fuels, lubricants, and other chemicals;
 - b. Segregating or diverting stormwater runoff away from or around pollutant generating activity.
 - c. Routing site drainage to recycling or otherwise preventing direct discharge of vehicle or equipment wash-water.
2. **Treatment Controls.** Owner shall implement emergency response and recovery procedures should a spill or leak occur. In addition, if the land use agency or the Authority determine that an oil spill or leak, or other illicit discharge, is probable, then the Owner shall construct and maintain additional BMP(s) for treatment of the potential illicit discharge.
3. **Prevention Measures.** Owners shall develop a plan, acceptable to the governing land use agency, and implement the following prevention measures:
 - a. Scheduled maintenance, signs and labels, and security systems.
 - b. Visual inspections to identify illegal dumping or disposal activities;
 - c. Scheduled preventative inspection and maintenance;
 - d. Spill prevention by controlling material handling and storage practices, and loading/unloading methods to minimize or prevent spill and leak occurrences;
 - e. Signage to clearly identify locations and handling requirements for significant materials;

- f. Employee training in materials handling, storage, and safety procedures;
- g. Record keeping and reporting.
- h. Recycling vehicle or equipment wash-water.

C. DESIGN CRITERIA AND STANDARDS

1. Best Management Practices.

Post-construction BMPs to control illicit discharges from commercial and industrial activities consist of source controls and treatment BMPs. Source controls are measures that prevent an illicit discharge from occurring (i.e., spill prevention), while treatment BMPs remove pollutants from stormwater prior to leaving the site.

a) Source controls include:

- **Prevention** - Practices that eliminate or reduce the amount and the chance of pollutants being generated on the site. This category includes good house keeping practices, such as employee training, signage, and labeling.
- **Exposure Minimization** - Practices that eliminate or minimize the chances of storm water runoff coming in contact with pollutants. Simply covering the activity greatly reduces, if not eliminates the potential for an illicit discharge.

b) **Treatment BMPs** include those post-construction BMPs described at Chapter III – Post Construction BMP Requirements, Section B – Design Criteria and Standards and also include clean-up or substance recovery after it has been released or spilled. Treatment practices are considered a last resort and should be used when source control options are not practical or sufficient to prevent illicit discharges.

For additional information regarding commercial/industrial stormwater discharges and BMPs, refer to, Volume 3 Best Management Practices.

2. Supplemental Reporting Requirements

In addition to the requirements for a plan for post-construction BMPs at Chapter III - Post Construction BMP Requirements, Section B (2) – Plan for Post Construction BMPs, Owners shall include the following information in the final or Phase III drainage reports:

a. Reporting Requirements.

- (1) Description of potential pollutant sources and material inventory, including:
 - (a) Type of material, products, by-products or finished product at facility;
 - (b) Storage locations;
 - (c) Loading and unloading areas; and
 - (d) Locations for:
 - (i) raw materials, by-products and finished product storage;
 - (ii) vehicle and equipment washing, maintenance and storage; and
 - (iii) outside manufacturing areas.
- (2) Stormwater quality control information, including:
 - (a.) Spill containment for fuel areas or other liquid storage containers;
 - (b.) For the items listed in item (2)(a) above, identify means to minimize contact with stormwater by enclosures, or minimize discharges of stormwater containing pollutants by:
 - (i) containment,
 - (ii) treatment, and/or
 - (iii) other means; and
 - (c.) Measures for spill and leak containment and emergency response.
- (3) A copy of the following documents, if applicable:
 - (a.) No Exposure Certification from the CDPHE, which certifies that all industrial activities and materials are completely sheltered.
 - (b.) An industrial discharge Stormwater Management Plan required by the Division, which identifies potential sources of pollution that may reasonably be expected to affect the

quality of stormwater discharges associated with industrial activity from the facility.

- (c.) Spill Prevention Control and Countermeasure Plan (SPCC) required by the CDPHE and 40 CFR Part 112.

- b. Review Procedures.** The Authority may review Stormwater Management Plans and submit recommendations to Land Use Agencies on compliance of the plans with CR-72.7 Guidance Document.

E. EXCLUSIONS

Requests for exclusion shall follow requirements outlined in Chapter I – Introduction, Section H - Additional Exclusions.

CHAPTER V - AGRICULTURAL BMP REQUIREMENTS

A. POST-CONSTRUCTION BMP REQUIREMENTS

Agricultural land uses are recognized as land disturbances and a potential source of pollutant loading. The Division has identified recommended BMPs for Agriculture and Silviculture activities as part of the Colorado Nonpoint Source Management Program. Agricultural Activities, identified at Chapter I – Introduction , Section F(1) – Agricultural Activities are exempt from the construction and post-construction BMP requirements of Chapters II – Construction BMP Requirements and III – Post Construction BMP Requirements of this CR-72.7 Guidance Document. However, certain activities are not excluded, including confined animal feedlot operations, commercial horse boarding stables, and the construction of facilities or other activities generating stormwater runoff associated with industrial construction activity.

Owners of all agricultural land disturbances are encouraged to implement applicable BMPs as identified in the Colorado Nonpoint Source Management Program, which recommends installation of BMPs on a voluntary basis.

Information on BMPs for specific agricultural uses is available as Appendix A to the Colorado Nonpoint Source Management Program. Each agricultural BMP contains a specifications guide of possible conservation practices. Most of these specifications are practices found in each Natural Resource Conservation Service Field Office Technical Guide (See . <http://efotg.nrcs.usda.gov/treemenuFS.aspx>), specifically research publication ARS-149¹⁵.

¹⁵ USDA, NRCS September 2003. *Agricultural Phosphorus and Eutrophication Second Edition*. ARS-149.

CHAPTER VI - STREAM PRESERVATION AREAS

Presented in this Chapter of CR-72.7 Guidance Document are additional requirements for post-construction BMPs not identified in Colorado's Phase II Municipal Guidance¹⁶ or CR-72.7 Guidance Document at Chapter III - Post-Construction BMP Requirements. These additional requirements are in accordance with 5 CCR 1002-72 at 72.7.2(c)(8)(i) under "Stream Preservation Areas".

A. REGULATED ACTIVITIES

Additional post-construction BMPs controls shall be implemented for all Tier 2 and Tier 3 new development and redevelopment within a stream preservation area, as defined at Chapter I - Introduction, Section E - Applicability. All post-construction BMPs for Tier 2 and Tier 3 new development and redevelopment within a stream preservation area shall be approved by the governing land use agency prior to commencement of any land disturbances. In the implementation of this CR-72.7-Guidance Document, the governing land use agency, may be more restrictive.

B. DESIGN CRITERIA AND STANDARDS

1. **BMP Requirements – Tier 3 Development and Redevelopment.** For all Tier 3 new development and redevelopment in stream preservation areas, Owners shall mitigate for the loss of alluvial recharge and filtration of stormwater through the alluvium resulting from construction of additional impervious surfaces in a stream preservation area. Mitigation requirements will be determined on a case-by-case basis by the land use agency and may include one or more of the following:
 - a. Implementing Channel Reclamation Measures as defined at Chapter I - Introduction, Section F – Definitions in accordance with Volume 2, Chapter 8, Sections 4 and 5.
 - b. Minimizing directly connected impervious area, in accordance with the Volume 3.
 - c. Implementing either one of the following individual BMPs, as part of requirements identified at Chapter III – Post Construction BMP Requirements, Section B – Design Criteria and Standards.
 - (1). Full Spectrum Detention.

¹⁶ CDPHE, WQCD, October 2001.

- (2). Porous Landscape Detention.
 - (3). Constructed Wetland Basin.
 - (4). Sand Filter Basins
- d. Or, one or more of the following BMPs in combination *with* Extended Detention Basins:
- (1) Grass Swales. All surface stormwater runoff from on-site impervious surfaces must be conveyed over grass swales before being discharged from the site, designed in accordance with Volume 3.
 - (2) Constructed Wetland Channels. All surface stormwater runoff from on-site impervious surfaces must be conveyed through wetlands before being discharged from the site, designed in accordance with Volume 3.
- e. Other BMPs. Other BMPs, which are not included in this CR-72.7 Guidance Document, may also be applied within Stream Preservation Areas to achieve the goal of maximizing reduction in nutrient loads and concentrations, as well as reducing sediment and other pollutants to improve water quality. If an Owner selects this option, the Owner must implement BMPs that can provide the expected probable pollutant reduction capabilities equivalent to, or greater than, the individual or combination BMPs described above.
2. **BMP Requirements – Tier 2 Development and Redevelopment.** For all Tier 2 new development and redevelopment in Stream Preservation Areas, Owners shall mitigate for the loss of alluvial recharge and filtration of stormwater through the alluvium resulting from construction of additional impervious surfaces in a Stream Preservation Area. Additional mitigation requirements include:
- a. Minimizing directly connected impervious area, in accordance with the Volume 3, or
 - b. Other BMPs that promote filtration and infiltration, in accordance with Volume 3.
3. **Stormwater Management Plan.** Owners shall prepare a Stormwater Management Plan that includes *additional* post-construction BMPs for their Development and obtain approval from land use agencies prior to commencement of land disturbances on their property. Plan requirements are identified at Chapter III – Post Construction BMP Requirements, Section B(2) – Plan for Post-Construction BMPs. If requested by the land use agency, the Authority may review plans and submit recommendations to land use agencies on compliance of the plans with CR-72.7 Guidance Document.

C. EXCLUSIONS

1. **Authorized Exclusions.** The following activities are exempt from the requirements for additional BMP for land disturbances within Stream Preservation areas (see CR-72.7.2(c)(8)(ii)):
 - a. The land disturbance is the result of implementation of an approved BMP, in accordance with this CR-72.7 Guidance Document.
 - b. Construction of roadway, highway, and underground utility crossings, provided Construction BMPs are implemented as required in Control Regulation section 72.7.2(b) and Post-construction BMPs are implemented as required in Control Regulation section 72.7.2(c).
 - c. Rural road construction and maintenance, except for a land disturbance associated with a rural within a stream preservation area, and provided that permittee requires post-construction BMPs specific to this activity.
 - d. Those automatic and authorized exclusions defined at Chapter II – Construction BMP Requirements, Section F - Exclusions and those at Chapter III – Post Construction BMP Requirements, Section G - Exclusions of this CR-72.7 Guidance Document.
2. **Authority Guidance.** In the interpretation of these authorized exclusions, the Authority considers stream or channel reclamation and restoration, and regional stormwater detention or water quality facilities to be approved BMPs in accordance with this CR-72.7 Guidance Document and, as such, are an authorized exclusion.
3. **Additional Exclusions.** Requests for Additional Authorize Exclusion shall follow requirements outlined in Chapter I – Introduction, Section H - Additional Exclusions.

CHAPTER VII – RURAL ROAD CONSTRUCTION AND MAINTENANCE

Presented in this Chapter of CR-72.7 Guidance Document are specific BMPs requirements for the construction, operation, and maintenance of Rural Roads. The requirements in this Chapter are in accordance with 5 CCR 1002-72 at 72.7.2(c)(4)(ii)(B) - Authorized Exclusions.

Unpaved Rural Roads are a source of pollution. Erosion of unpaved roadways occurs when soil particles are loosened and carried away from the roadway base, ditch, or road bank by water, wind, traffic, or other transport means. Exposed soils, high runoff velocities and volumes, sandy- or silty-soil types, and poor compaction increase the potential for erosion.

Loosened soil particles are carried from the road bed and into the roadway drainage system. Particles most often settle out where they diminish the carrying capacity of the ditch, and in turn cause roadway flooding, which subsequently leads to more roadway erosion. Most of the eroded soil, however, ultimately ends up in streams and rivers where it diminishes channel capacity, causing more frequent and severe flooding; destroys aquatic and riparian habitat; and has other adverse effects on water quality and water-related activities.

Paved Rural Roads are also sources of pollution, but to a lesser extent, since most of the driving surface is covered with an impermeable material that essentially eliminates disturbance of the soil particles on the traveled surface. However, road side ditches are still subject to the same erosion and sedimentation forces and control of these forces is required.

In addition, Rural Roads, whether paved or un-paved, are typically constrained by ROW limitations, sometimes even more so than for developments in urban areas. Minimum post-construction BMPs described at Chapter III - Post Construction BMP Requirements of this CR-72.7 Guidance Document are not always practical or warranted, since most pollutants from Rural Roads can be controlled by simpler, more direct measures. Therefore, minimum BMP requirements for Rural Roads are different than for more roadways in typical urban developments.

A. REGULATED ACTIVITIES

Temporary construction erosion and sediment controls and permanent BMPs shall be implemented for all Rural Roadway construction and maintenance activities, as defined by this Chapter of CR-72.7 Guidance Document. All BMPs for Rural Road construction shall be approved by the governing land use agency prior to construction. In the implementation of this CR-72.7-Guidance Document, the governing local land use agency, may be more restrictive.

B. REQUIRED BMPs

1. **Construction BMPs.** Owners shall implement, as a minimum, the following temporary construction BMPs for Rural Roads:
 - a. Silt fences, erosion control logs or other perimeter control BMPs that prevent soil transport off the construction site.
 - b. Check structures, such as rock, wire enclosed rock tubes, coconut wattles, or other sediment control measures to trap sediment from discharging.
 - c. Erosion control measures to prevent disturbances that are subject to erosion.
 - d. Water quality control measures to control velocities, preserve water quality conditions and preserve ditch capacity.
2. **Post-Construction BMPs.** Owners shall implement, as a minimum, the following permanent BMPs for Rural Roads:
 - a. Trapezoidal or “V” shaped roadside ditches with a side slope no steeper than 3:1 to minimize the need for routine cleaning of ditches due to accumulation of road sediment.
 - b. Re-vegetation by drilling, seeding, and mulching using locally specified seed mixes developed in cooperation with the NRCS or the County Soils Conservation District promoting both short- and long-term, primarily native grasses.
 - c. Sediment traps, turn-out ditches, or other measures approved by the land use agency to control velocities and preserve ditch capacity.
 - d. Strategically placed culverts to maintain stable velocity and ditch capacity and provide greater distribution of runoff.
 - e. Culvert discharge control structures, such as rock lined discharge basins or more formal sediment basins.
3. **Maintenance Activities.** Where Rural Roads remained un-paved, Owners shall implement, as a minimum, dust suppression using water or other suppressants, such as magnesium chloride.

C. EXCLUSIONS

1. **Authorized Exclusion.** Exclusions defined at Chapter III – Post Construction BMP Requirements, Section G – Exclusions concerning Post-construction BMP exclusions is applicable to BMP requirements for Rural Road construction and maintenance.

2. **Additional Authorized Exclusion.** Requests for Additional Authorize Exclusion shall follow requirements outlined in Chapter I – Introduction, Section H - Additional Exclusions.

CHAPTER VIII – HIGHWAY AND ROADWAY RECONSTRUCTION (RESERVED)

The Authority and its members will continue to work with the Division to identify water quality impacts and mitigation measures, clarify the definition of redevelopment as it applies to highway and roadway reconstruction, and identify regulatory guidelines for post construction BMPs specifically related to highway and roadway reconstruction. Until then, all Highway and Roadway Reconstruction shall follow Construction BMP Requirements in Chapter II and Post-Construction BMP Requirements in Chapter III.

CHAPTER IX – LARGE LOT SINGLE FAMILY DEVELOPMENT

Presented in this Chapter of CR-72.7 Guidance Document are specific BMPs requirements for the construction, operation, and maintenance of BMPs required for Large Lot Single Family Development. The requirements in this Chapter are in accordance with 5 CCR 1002-72 at 72.7.2(c)(4)(i)(H) _ Authorized Exclusions.

Large Lot Single Family development is defined at CR-72.7 Guidance Document Chapter I – Introduction, Section F - Definitions. Developments that do not meet all of these conditions, must provide post-construction BMPs in accordance with Chapter III – Post Construction BMP Requirements of this CR-72.7 Guidance Document.

Developments with lower imperviousness are known to result in less runoff rates and volumes than developments with higher imperviousness and, therefore, have less impact on stormwater quality and channel degradation. In their natural state, sub-basins in Cherry Creek have an effective imperviousness generally less than 5%. As imperviousness increases with development, runoff rates and volumes also increase, gradually resulting in some degradation of drainageways, channels, and streams. Eventually imperviousness increases to the point where degradation reaches serious levels, resulting in environmental damage. This imperviousness is referred to as the “threshold imperviousness.” Whereas “threshold imperviousness” is not a precise value, it generally is around 10- to 20% imperviousness for Cherry Creek watershed. Therefore, the level of imperviousness of a watershed can be used as a “measure” of the channel’s sensitivity to degradation.

The Authority recognizes that, in addition to reducing the *rate* of runoff from new development, controlling the amount or volume of runoff from new development will reduce development impacts on water quality and the stream channels. One method of reducing runoff volume is to minimize “directly connected impervious area” (called DCIA) by directing runoff through pervious areas, which allows more runoff to infiltrate into the ground, recharging the groundwater and reducing the total volume of runoff.

Therefore, the Authority has taken into account the watershed imperviousness and methods to reduce runoff volume to develop specific post-construction BMPs for Large Lot Single Family Development (see Chapter III – Post Construction BMP Requirements Section G - Exclusions). By implementation of these BMPs there will be minimal, if any, impacts on the watershed channels and stormwater quality.

A. REGULATED ACTIVITIES

1. Authority Guidance.

In the interpretation of the Additional Exclusions in accordance with 5 CCR 1002-72 at 72.7(c)(4)(iii), the Authority further defines Large Lot Single Family Development as follows:

- a. The individual lot area shall be 2.5-acres or larger. The lot area constraint is not an average lot size or a gross density area, but the area of the individual lots.
- b. The individual lot imperviousness shall not be greater than 10%. The lot impervious constraint is not an average of the lot imperviousness or a gross imperviousness, but the imperviousness of the individual lots.
- c. The imperviousness shall be calculated based on building footprint areas and concrete, stone, or asphalt pavement areas, including out buildings, sports courts, and patios. Gravel driveways or paths are not included in the impervious area calculation.

2. BMP Requirements.

Temporary construction erosion and sediment controls BMPs shall be implemented for all single family development, as defined by Chapter II – Construction BMP Requirements of CR-72.7 Guidance Document.

Post-construction BMPs shall be implemented for Large Lot Single Family development, as defined by this Chapter of CR-72.7 Guidance Document.

All BMPs shall be approved by the governing land use agency prior to construction. In the implementation of this CR-72.7-Guidance Document, the governing land use agency, may be more restrictive.

B. REQUIRED POST CONSTRUCTION BMPs

1. **Post-Construction BMPs.** Owners of large lot single-family developments with an area greater than 2.5 acres in size and having total lot imperviousness, including roadways and driveways, less than 10.0% and that uses grass swales or buffers for stormwater conveyance, instead of curb and gutter shall implement, as a minimum, the following BMPs:

- a) Reduce the amount of directly connected impervious areas by directing all rooftop runoff to a Grass Swale or Grass Buffer.

Reduce the amount of runoff volume by conveying all storm runoff from impervious surfaces through Grass Swales or Grass Buffers along roadways or driveways, instead of conveying runoff by curb and gutter.

- b) Other approved BMPs in accordance with this CR-72.7 Guidance Document.
- 2. **Procedures.** Owners shall prepare a site grading and drainage plan and documentation showing that their site meets the requirements of this Chapter for approval by the governing land use agency.
- 3. **Maintenance.** The governing land use agency shall require the Owner to maintain the BMPs in good working condition.

C. EXCLUSIONS

If the owner request an exclusion from requirements of this Chapter, the procedures outlined in Chapter I – Introduction, Section H - Additional Exclusions shall apply.

CHAPTER X – TRAIL CONSTRUCTION

Presented in this Chapter of CR-72.7 Guidance Document are specific BMPs requirements for the construction, operation, and maintenance of BMPs required for trails. The requirements in this Chapter are in accordance with 5 CCR 1002-72 at 72.7.2(c)(4)(ii)(C) - Authorized Exclusions.

Trails are defined as access areas constructed for the purpose of operations, maintenance, or recreation that are constructed either with pervious surfaces (i.e., aggregate) or impervious surfaces (i.e., concrete, or asphalt).

Trails are important to water quality, whether they be for maintenance purposes to insure reasonable access to BMPs or whether they be for recreation purposes which provides opportunities for public education regarding stormwater quality and BMPs. Often trails increase impervious surfaces, which increases erosive forces of runoff from the trails themselves and, therefore trails can have a negative impact on water quality. In addition, a single trail project can cover thousands of linear feet and result in an increase in impervious surfaces well beyond a reasonable upper limit of 5,000 square feet. However, because of the linear nature of trails, runoff from the trail can be dispersed over longer lengths, which allows for more natural BMP approaches such as vegetative buffers, as opposed to BMPs that require WQCV resulting in concentrated discharges and larger, localized disturbances. Concentrated discharges are more problematic and require additional measures to mitigate for the energy of the discharge.

Therefore, the Authority recognizes both the potential impact of trails on water quality due to their increase in imperviousness and the linear nature which allows the use of BMP with dispersed runoff and lesser impact. By implementation of these types of BMPs there will be minimal, if any, impacts on the watershed channels and stormwater quality.

A. REGULATED ACTIVITIES

Temporary construction erosion and sediment controls BMPs shall be implemented for all trail construction, as defined by Chapter II – Construction BMP Requirements of CR-72.7 Guidance Document.

Post-construction BMPs shall be implemented for all trail construction, as defined by this Chapter of CR-72.7 Guidance Document.

All BMPs shall be approved by the governing land use agency prior to construction. In the implementation of this CR-72.7 Guidance Document, the local land use agency, may be more restrictive.

B. REQUIRED POST CONSTRUCTION BMPs

1. **Post-Construction BMPs.** Owners of trails shall implement, where practical, BMPs that
 - a) Limit construction of trails within unstable and highly erosive soils and saturated soils.
 - b) Slope the trail toward the downhill side (“outslope”) to promote dispersed runoff.
 - c) Provide dips in the longitudinal trail profile (“rolling trail dips”) at locations where natural drainageways or seeps cross the trail alignment, instead of using culverts or water bars that concentrate runoff.
 - d) Minimize concentrated runoff points by utilizing BMPs that disperse discharges, such as Grass Swale, Grass Buffer, or other approved BMP. If concentrated discharges, such as culverts, are necessary, provide BMPs that widely disperses flow at the culvert outlet, such as level spreaders.
 - e) Within flat terrain, elevate the trail above grade and allow for seepage underneath the trail through pervious materials.
2. **Procedures.** Owners shall prepare a site grading and drainage plan and documentation showing that their site meets the requirements of this Chapter for approval by the land use agency or Authority if the Owner is a land use agency..
3. **Maintenance.** The land use agency shall require the Owner to maintain the BMPs in good working condition.

C. EXCLUSIONS

If the owner request an exclusion from requirements of this Chapter, the procedures outlined in Chapter I – Introduction, Section H - Additional Exclusions, shall apply.

CR-72.7 Guidance Document

APPENDIX A – WQCV HYDROLOGIC ANALYSIS

The following calculation steps and example provides guidance for compliance with Chapter III – Post Construction BMP Requirements, Section B (1) – Minimum Requirements of the CR-72.7 Guidance Document to determine if the WQCV storm event discharges from a Tier 2 New Development or Redevelopment site.

- 1) WQCV Storm event is defined as 0.5 inches in 1-hour.
- 2) Calculate imperviousness of the drainage sub-basin which includes the proposed Tier 2 New Development or Redevelopment. The sub-basin downstream limit is the property boundary.
- 3) Calculate NRCS CN value based on the following equation:

$$CN = 98 * Imp + X * (1 - Imp)$$

Where:

- Imp. = Imperviousness as a decimal
X = Calibration value based on NRCS Soil Type

NRCS Soil Type	Calibration Value
A	39
B	61
C	74
D	80

- 4) Calculate excess precipitation for the WQCV storm event using the following equations:

$$Q = (P - IA)^2 / ((P - IA) + S)$$

$$S = (1,000 / CN) - 10$$

$$IA = 0.2 S$$

Where:

- Q = Accumulated Excess (in)
P = Accumulated Rainfall Depth (in)
IA = Initial abstraction (in)
S = Currently Available Soil Moisture Storage Deficit (in)
CN = SCS Curve number

- 5) If excess precipitation calculated above is less than 0.01-inches, then it is assumed that the WQCV storm event does not result in a discharge from the site.

Example Calculation.

WQCV Hydrologic Analysis Example

Given:
 Drainage basin area = 1.5 acres
 Existing Imperviousness = 0.04
 Proposed Imperviousness = 0.11
 WQCV Storm Event = 0.5 inches in one hour
 Soils Type = D
 Maximum runoff criteria = 0.01 inches

Step 1 - Check New Imperviousness Area for Tier 2 Requirements

Existing Imperviousness = 2614 sf
 Proposed Imperviousness = 7187 sf
 New impervious area = 4574 sf
 Meets Tier 2 Requirements ? Yes

Step 2 - Calculated CN

$$CN = 98 * Imp + X * (1 - Imp)$$

Imp	("X") =	NRCS Soil Type			
		A	B	C	D
		39	61	74	80
			CN VALUE		
0.11		45.5	65.1	76.6	82.0

Then CN for this analysis = 82.0

Step 3 - Calculate Excess Runoff

Equations:

$$Q = (P - 0.2S)^2 / (P + 0.8S)$$

$$S = 1000 / Cn - 10$$

$$Ia = 0.2 * S$$

Excess Runoff Calculation:

Cn	S	Ia		
82.0	2.20	0.440		
	Q	Q/P	Runoff Volume	
	0.002	0.003	(cu ft)	(ac ft)
			9	0.000

Meets WQCV Runoff Criteria (?) Yes