CHAPTER 7

4 STEP PROCESS AND DETENTION PRINCIPLES

Contents

1.0 DEFINITIONS

Development Site: Site that results in land disturbance of greater than or equal to 1 acre, including sites less than 1 acre that are part of a larger common plan of development or sale. Development Sites include both New Development and Redevelopment. Public improvements required for a particular development are included in the development site.

Disturbance (Land Disturbance): A man-made alteration or disturbance of the ambient land surface, natural cover or topography of land, including but not limited to clearing, grading, excavation, demolition, installation of new or improved haul roads and access roads, staging areas, stockpiling of fill materials, and borrow areas. Disturbance does not include roadway or aircraft moving surfaces where the subgrade is not disturbed.

Excess Urban Runoff Volume (EURV): EURV represents the difference between the historic and post-development runoff volumes for the range of storms that produce runoff from pervious land surfaces.

Full Spectrum Detention (FSD): An approach to detention that attempts to mimic historic runoff rates for up to and including the 100 year storm.

New Development: The development of a previously undeveloped site. Previously undeveloped sites are defined as sites with less than 35% of hard surface coverage in the existing condition.

PCM Volume Accounting Ledger: An accounting ledger tracking the amount of WQSV available and the amount used by existing and proposed developments within a PCM tributary area.

Permanent Control Measure (PCM): A permanent measure designed to mitigate water quality impacts due to development and redevelopment projects. Examples of Permanent Control Measures include extended detention basins and sand filters.

Redevelopment: The development of a previously developed site. Previously developed sites are defined as sites that are substantially developed with 35% or more of hard surface coverage in the existing condition.

Regional Detention: Detention facilities that serve multiple development projects or multiple phases of a development project.

Site Expansion: Expansion of a site occurs when the impervious area on a partially developed site is increased by greater than 50% of the existing impervious area.

State Waters (Waters of the State): Any and all surface waters and subsurface waters which are contained in or flow in or through this state, but does not include waters in sewage systems, waters in treatment works for disposal systems, waters in potable water distribution systems, and all water withdrawn for use until use and treatment have been completed. This definition can include water courses that are usually dry. State waters are also known as waters of the state. For the purposes of the City MS4 Permit, State Waters does not include subsurface waters.

Temporary WQSV Facility: A temporary control measure designed to treat the WQSV for an interim condition.

Water Quality Capture Volume (WQCV): A volume of water generated by the 80th percentile runoff event, in watershed inches. In the Colorado Springs area this volume is 0.6 inches.

Water Quality Storage Volume (WQSV): A volume of water, in acre-feet, calculated as the runoff occurring from the water quality storm event for a specific area. This is a quantity of water used for the design of certain water quality measures.

2.0 4 STEP PROCESS AND DETENTION TRIGGERS

2.1 Disturbance Area

The disturbance area for a project is the total disturbance area, less any applicable exclusions. The total disturbance area includes public improvements required on behalf of a development.

2.2 Disturbance Area Exclusions

Some areas can be excluded from disturbance area calculations. The following exclusions may be used to reduce or eliminate the amount of disturbance area associated with a project for the purposes of applying the 4 Step Process and detention requirements.

The exclusions in this section are not applicable to disturbance area calculations associated with grading and erosion control requirements.

Claiming one or more of the exclusions in this section is optional. It is up to the site engineer to determine whether claiming exclusions would benefit the development site.

2.2.1 Utility Installation and Maintenance

All utility installation and maintenance that does not permanently alter the terrain, ground cover, or drainage patterns from those present prior to the project may be excluded. Utility tie-ins extending beyond the project site are also included in this exclusion.

2.2.2 Areas to Remain Pervious

Areas that will remain pervious without underdrains after development are included in this exclusion.

2.2.3 Channel Stabilization

Channel stabilization projects, where channel stabilization is the main purpose of the project, are included in this exclusion.

Any portion of a trail or public infrastructure project (e.g., access roads, drop structures, bank stabilization, spillways), occurring within the proposed top of bank limits of a named channel is included in this exclusion. The proposed top of bank limits are typically determined by a change in slope, but ultimately the proposed top of bank limits are determined based on the reviewer's discretion.

2.2.4 Trails

Trails shown as Urban Trails in Map 23 of the Parks, Recreation, and Cultural Services Park System Master Plan are included in this exclusion. Additionally, trails constructed by the City are included in this exclusion.

2.2.5 Stormwater Facilities

Stormwater facilities constructed by the City, including unpaved maintenance roads, are included in this exclusion.

2.3 4 Step Process

All sites with 1 acre or more of disturbance, including projects with less than 1 acre of disturbance that are part of a larger common plan of development, must comply with the 4 Step Process.

Redevelopment sites that disturb less than 1 acre and are not part of a larger common plan must comply with the conditions of any existing previously approved drainage reports related to the 4 Step Process.

2.3.1 Larger Common Plan

Generally, sites are considered to be part of a larger common plan of development if the site area is included in a Land Use Plan, Concept Plan, Development Plan, Master Development Drainage Plan, Preliminary Drainage

Report, or Final Drainage Report approved after November 1, 2002, that includes an area associated with 1 or more acres of disturbance.

Redevelopment sites impacting an area within an existing development that were not contemplated during the design of the original development are generally not considered to be a larger common plan. For example, a portion of a parking lot redeveloped to be a building is not considered to be a larger common plan because the building was not contemplated during the design of the original development.

Sites are also generally considered to be part of a larger common plan if two or more sites meet all of the following conditions:

- Are constructed within the span of three years,
- Are constructed within ¼ mile of each other, and
- Are developed or built by the same person or entity and result in a similar building product.

City maintenance programs, redevelopment overlays, and neighborhood plans are not considered to be larger common plans.

Ultimately, larger common plan determinations are up to the reviewer's discretion. Applicants are encouraged to reach out for a determination early in the development process.

2.4 Detention

2.4.1 New Development

Detention is required for all new development projects that disturb 1 acre or more. New development sites under 5 acres can meet the development detention requirement by successfully infiltrating at least 75% of the WQSV.

2.4.2 Redevelopment

Detention is required for all redevelopment projects that disturb 1 acre or more unless the downstream existing drainage system can be shown to have adequate capacity for anticipated flows, including flows from the redevelopment site. Redevelopment sites under 5 acres can meet the development detention requirement by successfully infiltrating at least 75% of the WQSV.

To determine adequacy of downstream capacity for the purposes of determining detention requirements, the downstream existing drainage system must be analyzed for a minimum of 500 ft from the redevelopment site's outfall location.

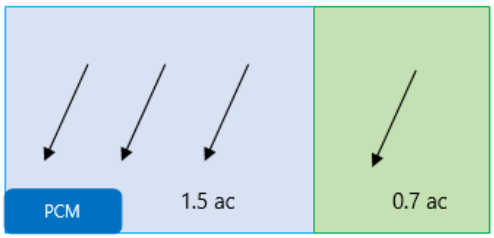
If multiple outfall locations are present, then adequate downstream capacity must be shown for each outfall. Detention on redevelopment sites is only required for areas tributary to outfalls that do not have adequate downstream capacity.

If an outfall does not have adequate downstream capacity, then developers may choose to upsize the outfall's downstream capacity to meet current criteria rather than to provide detention. Areas to be upsized must be discussed in advance with review staff to determine feasibility.

Redevelopment sites in the downtown corridor may be eligible to pay a per acre fee to help fund projects to increase downstream capacity in lieu of completing the projects themselves. Contact review staff for additional information.

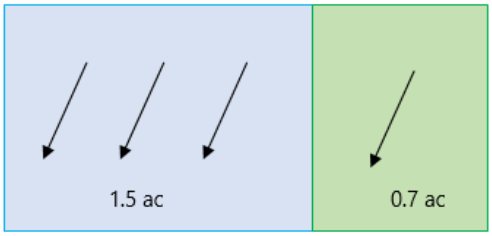
2.4.3 Site Expansion

Detention is required for site expansion projects if detention has been provided for the existing developed area and the site expansion area is tributary to an existing detention facility under proposed conditions.

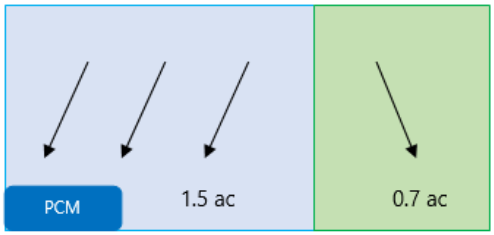


Detention is not required for the full site expansion if the project will not result in 1 acre or more of disturbance and if one or both of the following conditions is true:

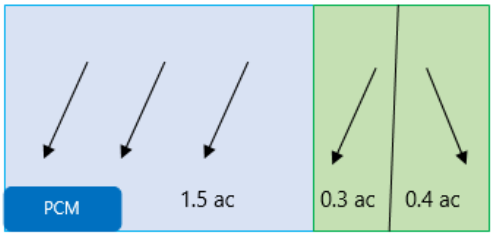
- Detention has not been provided for the existing developed area, and/or



- The site expansion is not tributary to an existing facility under proposed conditions.



If a site expansion falls under multiple categories, individual portions of the site must follow the requirements above. For example, in the diagram below the 0.3-acre portion of the site expansion requires detention, while the 0.4-acre portion of the site expansion does not require detention.



3.0 PERMANENT CONTROL MEASURE PRINCIPLES

3.1.1 PCM Consolidation

Developments must minimize the number of PCMs provided to the maximum extent practicable. PCM locations must be shown on Land Use Plans.

3.1.2 PCM Location

Unless constructed on behalf of a Public Works Department project, PCMs are not allowed in the public ROW without approval from City Engineering.

Publicly maintained PCMs must be located in the public ROW, on a dedicated Tract, or in a Public Drainage or Public Improvement easement.

PCMs must not be located within Waters of the State.

3.1.3 PCM Maintenance

For the purposes of this section, public maintenance is maintenance performed by the Public Works Department of the City of Colorado Springs. Private maintenance is maintenance performed by all other entities, private or public.

PCMs must be privately maintained, except in the following instances:

- The PCM is constructed as part of a Public Works project, or
- All areas tributary to the PCM are single family residential, and the PCM qualifies as a regional facility.

3.1.4 DBPSs and Land Use Plans

Developments are required to follow Drainage Basin Planning Studies (DBPSs) and Land Use Plans for PCM location and tributary area requirements unless further defined in an acceptable location as part of the Development Plan process.

3.1.5 PCM Timing

For PCMs serving multiple developments, PCMs must be implemented by the first phase of development or filing, whichever is smaller.

3.1.6 PCMs and the Development Process

Financial assurances for PCMs must be posted and PCM Plans must be approved according to the requirements in Chapter 3 prior to building permit release. PCMs must be installed and accepted into probationary acceptance (public) or accepted (private) prior to Temporary Certificate of Occupancy (TCO) and Certificate of Occupancy (CO) issuance.

3.1.7 Underground PCMs

The use of underground, storage-based control measures is generally prohibited; however, they may be allowed on a case-by-case basis using the variance procedures described in the Chapter 3 of this Manual. Variances for underground storage-based treatment will not be granted for new development over 15 acres.

When the Pollutant Removal Treatment Standard is allowed, underground flow-through control measures are authorized as part of the required implementation of the 4 Step Process under the following conditions:

- Underground flow-through control measures are allowed at design points with tributary areas less than 15 acres. Multiple underground flow-through control measures may be used to meet this requirement.

- Underground flow-through control measures may be allowed on a case-by-case basis using the variance procedures described in this Manual at design points with tributary areas greater than 15 acres.

Publicly maintained underground PCMs can only be installed on behalf of public projects or programs.

Maintenance agreements for private underground storage-based control measures must include an owner acknowledgement regarding specific long-term inspection and maintenance requirements.

Permanently installed pumps for stormwater shall not be used.

4.0 STEP 1 – VOLUME REDUCTION

4.1 Volume Reduction through Green Infrastructure

Step 1 of the 4 Step Process is to infiltrate a minimum amount of volume on a site.

Runoff from impervious areas that are part of a new development or redevelopment project subject to the 4 Step Process must reduce runoff peaks, volumes, and pollutant loads from urbanizing areas.

4.2 Infiltration Requirements

Infiltration requirements for different situations are described below:

- Sites with more than 50% Type D soils, slopes greater than 15% on more than 50% of the site in the proposed condition, or groundwater conditions less than 1 ft from the proposed finished grade on more than 25% of the site:
    - Tracking method and submittal requirement:
        - Sites must use the Runoff Reduction tab of the MHFD-BMP workbook or SWMM modeling using cascading planes.
        - Complete backup calculations must be submitted in the site drainage report.
- Roadway, trail, utility, and sidewalk specific projects not associated with new development:
    - Tracking method and submittal requirement:
        - Sites must use the Runoff Reduction tab of the MHFD-BMP workbook or SWMM modeling using cascading planes.
        - Complete backup calculations must be submitted in the site drainage report.

- Sites where building setback requirements result in less than 10 ft of perimeter setback from proposed buildings for more than 75% of the site perimeter, or constrained sites where the Stormwater Enterprise Manager determines infiltration metrics to be infeasible:
    - Tracking method and submittal requirement:
        - Sites must use the Runoff Reduction tab of the MHFD-BMP workbook or SWMM modeling using cascading planes.
        - Complete backup calculations must be submitted in the site drainage report.
- All other Development Sites:
    - Minimum volume reduction through infiltration, evaporation, and evapotranspiration:
        - 4% of the runoff volume for the 2-year rainfall event, or
        - 10% of the WQSV.
    - Tracking method and submittal requirement:
        - Sites must use the Runoff Reduction tab of the MHFD-BMP workbook or SWMM modeling using cascading planes.
        - Complete backup calculations must be submitted in the site drainage report.

Any reduction in runoff volume should be deducted from the required WQSV for the site. If the design engineer is able to prove that 75% of the WQSV for the Development Site is infiltrated in compliance with the details of this section, Step 2 requirements are met without additional treatment measures.

5.0 STEP 2 – VOLUME TREATMENT

5.1 Water Quality Storage Volume Treatment

Step 2 requires the implementation of PCMs which seek to address water quality impacts from the development site.

After volume reduction through Step 1, runoff must be treated through infiltration, capture and slow release, or pollutant removal. If the design engineer proves that 75% of the WQSV is infiltrated in accordance with Step 1, Step 2 requirements are met without additional treatment measures.

WQSV facilities may provide both water quality and volume reduction benefits, depending on the control measure selected.

5.2 Treatment Coverage

At least 95% of the development site must be treated using one or more of the treatment options described below. The remaining 5% must be treated to the maximum extent practicable.

Treatment coverage must be documented by design point in table format in the site drainage report (see drainage report checklists).

5.3 Treatment Options

PCMs for development sites must be designed in accordance with this Manual and must meet one of the following design standards:

1. Volume Reduction Standard: The site is designed such that 75% of the WQSV is infiltrated.
2. WQSV Standard: The PCM is designed to provide treatment and/or infiltration of the WQSV.
3. Pollutant Removal Standard: The PCM is designed to treat at a minimum the 80th percentile storm event. The control measure shall be designed to treat stormwater runoff in a manner expected to reduce the event mean concentration of total suspended solids (TSS) to a median value of 30 mg/L or less. This standard may not be used on sites where full spectrum detention is required according to this Manual.

5.3.1 Modifications to Existing PCMs

Development sites that must modify an existing PCM, other than adding or enhancing maintenance access or safety features without affecting PCM volume, must modify the entire PCM to meet current criteria.

5.3.2 Utilizing a Regional PCM

To use existing regional PCMs to meet Step 2 requirements without retrofitting the PCM to meet current criteria, development sites must meet all of the following conditions:

1. Development site must be included in the PCM tributary area.
2. The development site must have been included in the tributary area during the original design of the PCM.
3. The engineer for the development site must prove that the original design of the PCM accounted for the development site and the development site is staying within 10% of the impervious area assumptions made for the original development site.

4. If a PCM Volume Accounting Ledger is available for the PCM, the development site engineer must provide updated calculations for the WQSV capacity of the PCM to include the proposed development.

The site drainage report must document how these conditions are met using calculations and relevant excerpts from the original drainage report for the PCM.

Developers may choose to reanalyze, redesign and rebuild existing regional PCMs to meet current criteria.

5.3.3 Temporary WQSV Facilities

Temporary WQSV Standard treatment is allowed on a case-by-case basis. Temporary Volume Reduction Standard or Pollutant Removal Standard treatment is not permitted. Temporary WQSV Facilities can be designed with or without full spectrum detention.

Where allowed, the temporary WQSV facility must function as a PCM in terms of design volumes and drain times. The 100-year release, orifice sizing, and orifice spacing must be designed in accordance with published criteria for PCMs.

If a variance is approved to allow for temporary treatment, all of the following steps must be taken:

- Temporary facilities must include erosion mitigation measures as necessary, such as riprap protection at concentrated flow inlets.
- An Inspection and Maintenance (I&M) Plan must be submitted and approved for the Temporary WQSV Facility.
- Financial assurances must be posted for the amount required to transition the Temporary WQSV Facility to a PCM.
- Temporary WQSV Facilities must be privately maintained.
- Temporary WQSV Facilities that will be modified into regional public PCMs must be platted, located either on a tract that has been dedicated to the City or on a public drainage easement.
- Temporary WQSV Facilities that will be modified into on-site facilities must be platted.
- Temporary WQSV Facilities that will be removed in the future must be on a parcel that has a recorded obligation to maintain the Temporary WQSV Facility pursuant to the drainage report for the site.
- A Notice of Obligation must be recorded on the property containing the Temporary WQSV Facility. The Notice must reference the Final Drainage Report for the site and must follow the template contained at the end of this chapter. This Notice of Obligation will be released after the PCM is constructed and accepted into probationary acceptance (public) or accepted (private).
- Temporary WQSV Facilities are not eligible for drainage reimbursements.

A Temporary WQSV Facility can be utilized for a period of up to five years from the date of original drainage report approval. Building permits and Certificates of Occupancy will be held after five years from the date of

original drainage report approval if the PCM has not been constructed and accepted. No extensions will be granted.

If the downstream regional PCM has not been constructed and accepted into probationary acceptance within five years of the date of original drainage report approval, the City has the right to use the financial assurances to construct the permanent facility without refunding the owner. The drainage report containing the Temporary WQSV Facility calculations must have the following disclaimer statement included as a condition of approval:

"A Temporary WQSV Facility is being constructed as an interim measure until the downstream regional permanent control measure (PCM), located _____, is constructed. If the downstream PCM is not constructed within five years of the approval date of this report, City has the right to use the financial assurances to construct the permanent facility without refunding the owner. Subsequent report approvals will not extend this deadline."

6.0 STEP 3 – STABILIZE DRAINAGEWAYS

6.1 Channel Stabilization

Step 3 requires channel stabilization measures to protect open channels from erosion resulting from increases in frequency, duration, rate, and volume of runoff associated with development. The construction and operation of a full spectrum detention facility prior to discharge of the developed flows does not remove the requirement for channel stabilization.

6.2 Responsibility for Stabilization

Developments adjacent to a channel for which improvements are specified in a DBPS are responsible for completing the specified improvements. If the specified improvements were constructed previously, adjacent development is responsible for re-constructing the improvements if the existing improvements are not in good condition as determined by Stormwater Enterprise inspection.

Adjacent to a channel is defined as the first developable property measured perpendicularly from the channel outwards, regardless of the existing or planned drainage patterns. Dedicating land to the City between the channel and the development area does not relieve this requirement. If specified in a DBPS, improvements are generally considered to be reimbursable according to the fee calculations found in the DBPS. Early coordination with the City is encouraged for the improvements which may be reimbursable.

6.3 DBPS Conformance

All improvements based on information in a DBPS will be required to follow current criteria while matching the intended function from the DBPS.

If a development is adjacent to a channel where no improvements are specified in a DBPS, improvements are still required as part of Step 3.

6.4 Channel Stabilization Timing

Where channel improvements are required, improvements must be constructed or 100% financial assurances paid prior to building permit issuance. Regardless of the timing of assurances, channel improvements must be constructed prior to CO or TCO issuance.

6.5 Channel Stabilization Scope

Downstream impact mitigation and/or channel stabilization may be required due to physical tie-in or hydraulic requirements or if review staff deems it appropriate based on site conditions. Improvements may need to extend outside of the boundaries of the development property. Where confusion arises, guidance should be sought from the review staff well in advance of a drainage submittal.

Open channel analysis with consideration to velocities, shear stresses, existing vegetation, hydraulic capacity, geomorphic characteristics, and other appropriate engineering variables may be utilized to prove natural channels will remain stable under post-development conditions. The analysis must utilize HEC-RAS or an approved equivalent software and engineering variables and channel characteristics must meet the requirements of this Manual. If existing channel conditions are adequately shown to be stable and in compliance with City criteria, then no additional channel stabilization will be required, unless specified in an approved DBPS.

The requirements under Step 3 apply only to areas within the City limits, unless otherwise specified in an annexation agreement.

6.6 Channel Fee In-Lieu

If a Stormwater Enterprise fee in-lieu program exists for a specific channel segment, developments adjacent to a channel may participate in that program to fulfill the requirements of Step 3.

STEP 4 – SOURCE CONTROL

Step 4 requires targeted source control measures based on site specific needs. Source control can include material storage, secondary containment, good housekeeping practices, and other source control measures. Mile High Flood District has guidance and information on types of source control measures that can be applied on development sites.

Adequate source control measures must be implemented on development sites prone to pollutants. Sites requiring source control include but are not limited to:

- Gas stations
- Car washes
- Dog daycares
- Heavy metals processing
- Sites with known environmental contaminants such as old landfills

7.0 DETENTION

In general, detention refers to full spectrum detention as defined in this Manual. Unless an alternative detention concept is approved in a Drainage Basin Planning Study, all development must provide full spectrum detention if detention is required according to this chapter.

Detention not associated with development may follow an alternative detention concept if approved through the review process.

7.1 Full Spectrum Detention

Full spectrum detention is a design concept introduced by the Urban Drainage and Flood Control District (Urbonas and Wulliman 2005) that attempts to mimic historic runoff rates for up to the 100 year storm. See Chapter 9 for additional information.

7.2 Use of Regional Detention

If detention is required for a development, and there is an existing regional detention facility which was approved as part of a master planning process, then the Development Site's detention requirements will be satisfied according to the following:

- If the existing downstream regional detention facility provides detention for the minor storm event (5 or 10 year) in addition to providing detention for the major storm event (100 year) and the facility was part of a previously approved master study, then only water quality treatment is required on-site.
- If the existing downstream regional detention facility does not provide detention for the minor storm event, but does provide detention for the major storm event, then excess urban runoff volume (EURV) treatment is required on-site.
- If the existing downstream regional detention facility does not provide detention for the major storm event, then full spectrum detention is required on-site.

In all cases, the site engineer must prove the development site was accommodated in the original detention facility design.