

**APPENDIX F**  
**TECHNICAL MEMORANDUM NO. 4**  
**Recommendations to Development Standards**

November 10, 1999

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**TO:** Bruce Moser,  
City of Corvallis

**FROM:** James Hansen,  
Brown and Caldwell

**PROJECT:** City of Corvallis  
Recommendations to Development Standards

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**Introduction**

This technical memorandum was prepared to assist the City of Corvallis with updating of the existing stormwater development standards. The recommendations provided below should be considered as interim measures that should be implemented until a more detailed evaluation can be performed later in the stormwater master planning process. However, the interim recommendations will improve the City's ability to manage both stormwater quantity and quality from new development or redevelopment.

A more detailed analysis of the development standards should be based on citywide definition of the stormwater problems and potential solutions as determined from the master planning process. The adoption of new development standards will have a major impact on future stormwater management within the city. The standards will impact many different interest groups, including citizens, environmental groups, developers, builders, realtors, engineers, landscape architects, and city staff. City departments affected by the standards include planning, engineering, development assistance, legal, and operations/maintenance. Private and public representatives should participate in the development of the modified development standards, policies, and ordinances in order to develop an effective stormwater management program.

## **Major Categories of Development Standards**

The major categories of stormwater development standards addressed by this technical memorandum include:

1. Design storm and method
2. Detention policy
3. Water quality policy
4. Acceptable types of water management facilities
5. Operation and maintenance requirements

The above noted categories are discussed in the following sections and are represented in the recommended design standards at the end of this document.

### **Design Storm and Method**

**Pipe sizing.** The Design Criteria Manual requires the use of the Rational Method for a 10-year storm event. Most cities use either a 10-year or a 25-year design storm for sizing drainage facilities. The decision is based on the level of flood protection desired by the community along with the cost of providing the additional level of protection. Modifying the design criteria with a longer return period (i.e., 25-year) design storm would create a situation where the collection systems in the newly developed areas of the city would have greater capacity than older downstream sections of the system, thus creating greater downstream flooding situations in both open channels and pipes. We recommend that the city stay with the 10-year design storm using the Rational Method for most conveyance facilities.

We recommend that additional guidance be provided with the use of the Rational Method. The method should not be used for drainage areas larger than 25 acres or have times of concentration that exceed 100 minutes. A hydrograph technique should be used for either of these situations. Flow routes should be identified for storms larger than the 10-year, up to and including the 100-year storm. The City should adopt or establish runoff coefficients and an intensity-duration-frequency curve for use on projects within the City's jurisdiction. This approach would help provide consistency in the design of stormwater facilities.

**Detention Facilities.** The design storm for detention facilities should be based on the 10-year return event with 24-hour duration based on the standard SCS type 1A rainfall distribution. A hydrograph approach provides the most accurate rainfall model for this analysis. The SCS TR-55/20 method or the Santa Barbara Urban Hydrograph (SBUH) method are recommended options. We understand that most of the Corvallis development community uses the SCS method rather than the SBUH method; therefore, use the SCS method as the approved city standard. We do not recommend the use of the Rational Method for designing detention facilities.

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**Water Quality Facilities.** The design storm for water quality facilities should be based on two-thirds of the two year storm with a 24-hour duration. This is similar to the design storm used by King County and is slightly more conservative than the storms used by City of Portland and the Unified Sewerage Agency. The more conservative approach will better prepare the city for future TMDL, NPDES Phase II and Endangered Species Act requirements. Water quality facilities should be designed using a hydrograph technique as recommended for detention facilities.

### Detention Policy

The existing level of development throughout the city has altered the natural drainage characteristics of the major surface water systems. These streams are under stress due to an increase in the volume and duration of stormwater runoff. In addition, some of the older piped collection systems and culverts are becoming undersized as additional development generates increased flows and durations. Detention and other types of stormwater management techniques are required to prevent these problems from getting worse.

### Water Quality Policy

Urban development creates a wide range of stormwater management related problems, including higher flow rates and increased water pollution. Surface water collects a variety of pollutants as it travels through the drainage system, including nutrients, suspended solids, organic matter, bacteria, hydrocarbons, trace metals, pesticides, thermal pollution and trash and debris. Water quality facilities constructed in new and redeveloped areas will help lessen the negative impacts associated with increased urban development.

### Acceptable Types of Water Management Facilities

Our letter dated May 13, 1999 identified five facility types that should be considered for immediate use for new development or redevelopment, including detention ponds, water quality ponds, sedimentation ponds, vegetated swales, and water quality inlets. The King County Manual should be used as guidance for the basis of design of these facilities. The City should consider the adoption of the other treatment facilities identified in the manual. A toolbox of acceptable facilities would allow developers to customize the design of detention and water quality systems to best meet the constraints of the site.

The City should consider developing a guidance manual for the design of stormwater quantity and quality facilities. A custom manual would address the specific needs of the Corvallis community. A manual specifically prepared for the City of Corvallis would provide the greatest ease of use for City staff and design professionals in the community. A minimum of \$75k would be required to produce such a manual. The total effort required would be dependent on the level of detail provided by the manual. Several of the manuals in use throughout the northwest cost many times that to produce.

## Operation and Maintenance Requirements

Detention and water quality facilities require routine maintenance to ensure the desired performance of the facility. The efficiency of most types of water quality facilities will drop significantly in the absence of routine maintenance. The maintenance requirements identified in the King County Manual should be followed for these facilities. Inspection of major stormwater facilities, including detention ponds, water quality ponds, vegetated swales, trash racks, etc. should be conducted annually. The City should develop and manage an inspection program to ensure that the maintenance is being performed for both public and privately owned facilities. The cost of the inspection program needs to be determined and an appropriate funding mechanism established for implementing the inspection program.

Support of the inspection program needs to be written into City code. The code needs to be modified to provide for enforcement actions to address maintenance deficiencies for privately owned facilities. Using the King County model, the City would perform the maintenance and charge the owner if the owner did not perform the required maintenance within a specified timeframe.

Facility access is a major complaint of many municipalities charged with maintaining storm water facilities. Where possible an all-weather access road should be provided to the site. This requirement is particularly important for those facilities requiring routine maintenance, such as, detention and water quality facilities. The City shall ensure during design review that adequate access to the facility is provided through a maintenance easement or other form of permanent legal transfer of the right-of-access to the City.

## Proposed Changes to the Design Criteria Manual

The following sections represent interim replacement or additional sections to the existing *Design Criteria Manual for Public Improvements*. The changes affect Section IV. STORM DRAINAGE. Only the subsections shown below are modified.

### IV. STORM DRAINAGE

#### B. Design Criteria

##### 1. Conveyance Facilities

###### a. Capacity

- 1) Conveyance facilities shall be designed to convey and contain the peak runoff flow from the 10-year design event. No surcharging of the system is allowed for the 10-year storm event. Conveyance system capacity shall be determined for most conveyance facilities using the Rational Method.

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A hydrograph technique shall be used for designing facilities draining areas larger than 25 acres or for sites that have a time of concentration longer than 100 minutes.

Acceptable hydrograph techniques include the Soil Conservation Service (SCS) TR-55 or TR-20 methods. The SCS Type 1A rainfall distribution for the 10-year, 24-hour storm shall be used with the hydrograph techniques.

- 2) The 10-year design shall be supplemented with an overland conveyance component demonstrating the safe passage of the 100-year, 24-hour SCS type 1A storm event. The overland component shall not be allowed to flow through or inundate existing buildings.
- 3) Sufficient capacity shall be designed into the system to account for the future growth potential of the area served as identified in the Comprehensive Plan.

### b. Sizing

- 1) Minimum pipe size for storm drain mains is twelve (12) inches.
- 2) Minimum pipe size for lines leading from curb inlets or catch basins to the main lines is ten (10) inches.

### c. Grades

- 1) All storm drains shall be designed at a grade that will produce a mean velocity when flowing full or half-full of at least two (2) feet per second.

### d. Separation

- 1) New combined sanitary sewer and storm drain systems will only be permitted in the existing combined sewer areas of the city.

## 2. Detention Facilities

- a. The maximum design storm for detention facilities shall be based on the 10-year return event with 24-hour duration based on the standard SCS Type 1A rainfall distribution. The Soil Conservation Service (SCS) TR-55 or TR-20 are recommended. The use of alternative hydrograph methods may be allowed, but require pre-approval by the City. The use of alternative techniques may require additional development review time. The use of the Rational Method for designing detention facilities is not permitted.

## 3. Water Quality Facilities

- a. The design storm for water quality facilities (vegetated swales, water quality ponds, sedimentation ponds, water quality vaults, etc.) shall be based on two-thirds of the 2-year, 24-hour SCS Type 1A design storm. The analysis and design shall be based on a hydrograph method. The Soil Conservation Service (SCS) TR-55 or TR-20 are recommended. The use

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of alternative hydrograph methods may be allowed, but require pre-approval by the City. The use of alternative techniques may require additional development review time. The use of the Rational Method for designing water quality facilities is not permitted.

### K. Detention Facilities

#### 1. When Required

All new development and redevelopment shall require detention unless specifically exempted from this requirement. When required, stormwater detention facilities shall be designed to capture run-off so the run-off rates from the site after development do not exceed the predeveloped conditions, based on the 2-year through 10-year, 24-hour design storms.

#### 2. Exemptions

- a. Detention is not required for sites draining directly into Mary's River or the Willamette River.
- b. Detention is not required if infiltration methods can be demonstrated to be feasible. A soil map or geotechnical report is required to document the infiltration rates of the soils in the area of the proposed infiltration facility. Infiltration shall not be allowed in areas with slopes over 10 percent.
- c. Detention is not required for single family residences not developed as part of a planned development.
- d. Detention is not required for areas specifically identified as exempt (not requiring detention) in the Corvallis Stormwater Master Plan.

#### 3. Standards

- a. Detention facilities shall be designed in accordance with criteria as established in the *King County, Washington Surface Water Design Manual*, September 1998 or the most recent final version.
- b. Parking areas should not be used as detention facilities except for larger storm events. Up to 6-inches of water depth is allowed to be detained in parking areas for storm events larger than the 10 year return event.
- c. Detention of storm water shall be limited to a single facility, rather than a series of smaller detention facilities, whenever possible. Detention facilities may be designed as combination detention and water quality facilities. Detention facilities may be designed "in-line" with water quality facilities.
- d. The detention facility must be designed to safely pass storms up to the 100-year, 24-hour event.

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### 4. Access and Maintenance Responsibility

- a. Detention facilities must be located on a site dedicated for public use. Access tracts, easements or permanent right-of-ways are required when the facilities do not abut the public right-of-way. The minimum width of an access easement is 15 feet. All-weather road(s) shall provide maintenance vehicle access to the facility and the control structures.
- b. The City will assume maintenance and operation responsibility for detention facilities within the improved public right-of-way for any residential subdivision with two or more lots, and any similar development or redevelopment where at least two-thirds of the developed contributing area is from single family or duplex residential structures on individual lots. Detention facilities for the above mentioned land uses shall be located in a tract or right-of-way dedicated to the City.
- c. The City does not accept maintenance responsibility for private storm water conveyance, detention, or water quality systems. Private systems include single family residential (not associated with a subdivision or multiple lot residential development), multifamily development, industrial, or commercial and all redevelopment for the above mentioned land uses.
- d. Maintenance requirements for stormwater facilities are identified in the King County Manual. A maintenance plan shall be submitted to the City for approval along with the design and analysis calculations prepared for the construction permit application.
- e. For public facilities, the City will assume maintenance responsibility two years after final construction approval by the City and upon passing an inspection by City inspectors to ensure the facility has been properly maintained, the vegetation clearly established, and the facility is operating as designed. The site developer/owner shall provide a maintenance bond to the City that shall remain in effect until the facilities are accepted by the City.
- f. The City reserves the right to perform maintenance on private facilities if those facilities are found to have the potential to have a negative impact on public facilities or water quality. The City will charge the owner for all expenses incurred from City performed maintenance.

### L. Water Quality Facilities

#### 1. When Required

All new development and redevelopment are required to construct quality facilities to reduce the contaminants entering the storm collection and surface water systems. The stormwater facilities shall be designed to remove 70 percent of the total suspended solids (TSS) entering the facility during the water quality design storm. This policy may require the use of a combination of water quality facilities to achieve the designed removal rate.

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### 2. Standards

- a. Water quality facilities shall be designed in accordance with criteria as established in the *King County, Washington Surface Water Design Manual*, September 1998 or the most recent final version.
- b. Acceptable water quality facilities include vegetated swales, water quality ponds, sedimentation ponds, water quality inlets, and infiltration facilities.
- c. The use of infiltration facilities is recommended where soil and slope conditions permit the use of this type of facility and the facilities do not have an adverse impact to adjacent or downhill properties.
- d. The use of multiple water quality facilities may be required to meet the performance standard. Chapter 6 of the King County Manual identifies seven types of treatment facilities that will meet the performance standards.
- e. Water quality facilities must be designed to safely pass without damage to the facility flows in excess of the water quality design storm up to the 100-year, 24-hour event. For some facilities, a bypass system will be required.

### 3. Access and Maintenance Responsibility

- a. Water quality facility access tracts, easements or permanent right-of-ways are required when the facilities do not abut the public right-of-way. All-weather road(s) shall provide access to the facility and the control structure as required for vehicular maintenance access.
- b. The City will assume maintenance and operation responsibility for water quality facilities within the improved public right-of-way for any residential subdivision with two or more lots, and any similar development or redevelopment where at least two-thirds of the developed contributing area is from single family or duplex residential structures on individual lots. Water quality facilities for the above mentioned land uses shall be located in a tract or right-of-way dedicated to the City.
- c. The City does not accept maintenance responsibility for private storm water quality systems. Private systems include single family residential (not associated with a subdivision or multiple lot residential development), multifamily development, industrial, or commercial and all redevelopment for the above mentioned land uses.
- d. Maintenance requirements for the facilities are identified in the King County Manual. A maintenance plan shall be submitted to the City for approval along with the design and analysis calculations prepared for the construction permit application. The maintenance plan shall describe the maintenance activity and frequency of execution.

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- e. For public facilities, the City will assume maintenance responsibility two years after final construction approval by the City and upon passing a City inspection to ensure the facility has been properly maintained and is operating as designed. The site developer/owner shall provide a maintenance bond to the City that shall remain in effect until the facilities are accepted by the City.
- f. The City reserves the right to perform maintenance on private facilities if those facilities are found to have the potential to have a negative impact on public facilities or water quality. The City will charge the owner for all expenses incurred from City performed maintenance.